FURUNO

Installation Manual
DOPPLER SONAR
CURRENT INDICATOR
CI-68

FURUNO ELECTRIC CO., LTD.

www.furuno.com

(Elemental Chlorine Free)

The paper used in this manual is elemental chlorine free.

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SAFETY INSTRUCTIONS

Read these safety instructions before you operate the equipment.

WARNING	Indicates a condition that can cause death or serious injury if not avoided.
CAUTION	Indicates a condition that can cause minor or moderate injury if not avoided.

Warning, Caution — Prohibitive Action — Mandatory Action

WARNING

Turn off the power at the switchboard before beginning the installation.

Fire or electrical shock can result if the power is left on.

Do not install the display unit or transceiver unit where it may get wet from rain or water splash.

Water in the equipment can result in fire, electrical shock or damage the equipment.

Do not open the cover unless totally familiar with electrical circuits and service manual.

High voltage exists inside the equipment, and a residual charge remains in capacitors several minutes after the power is turned off. Improper handling can result in electrical shock.

The transceiver unit weights 17 kg. Reinforce the mounting area, if necessary.

WARNING

Install the specified transducer tank in accordance with the installation instructions. If a different tank is to be installed the shipyard is solely responsible for its installation, and it should be installed so the tank doesn't strike an object.

The tank or hull may be damaged if the tank strikes an object.

The mounting location must be away from rain and water splash.

Use the proper fuse.

Use of a wrong fuse can result in damage to the equipment or cause fire.

⚠ CAUTION

Be sure that the power supply is compatible with the voltage rating of the equipment.

Connection of an incorrect power supply can cause fire or damage the equipment.

Do not install the transducer where noise or air bubbles is present.

Performance will be affected.

Do not allow warm water or any other liquid other than seawater or fresh-water to contact the transducer.

Damage to the transducer may result.

Power on the transducer in the water.

⚠ CAUTION

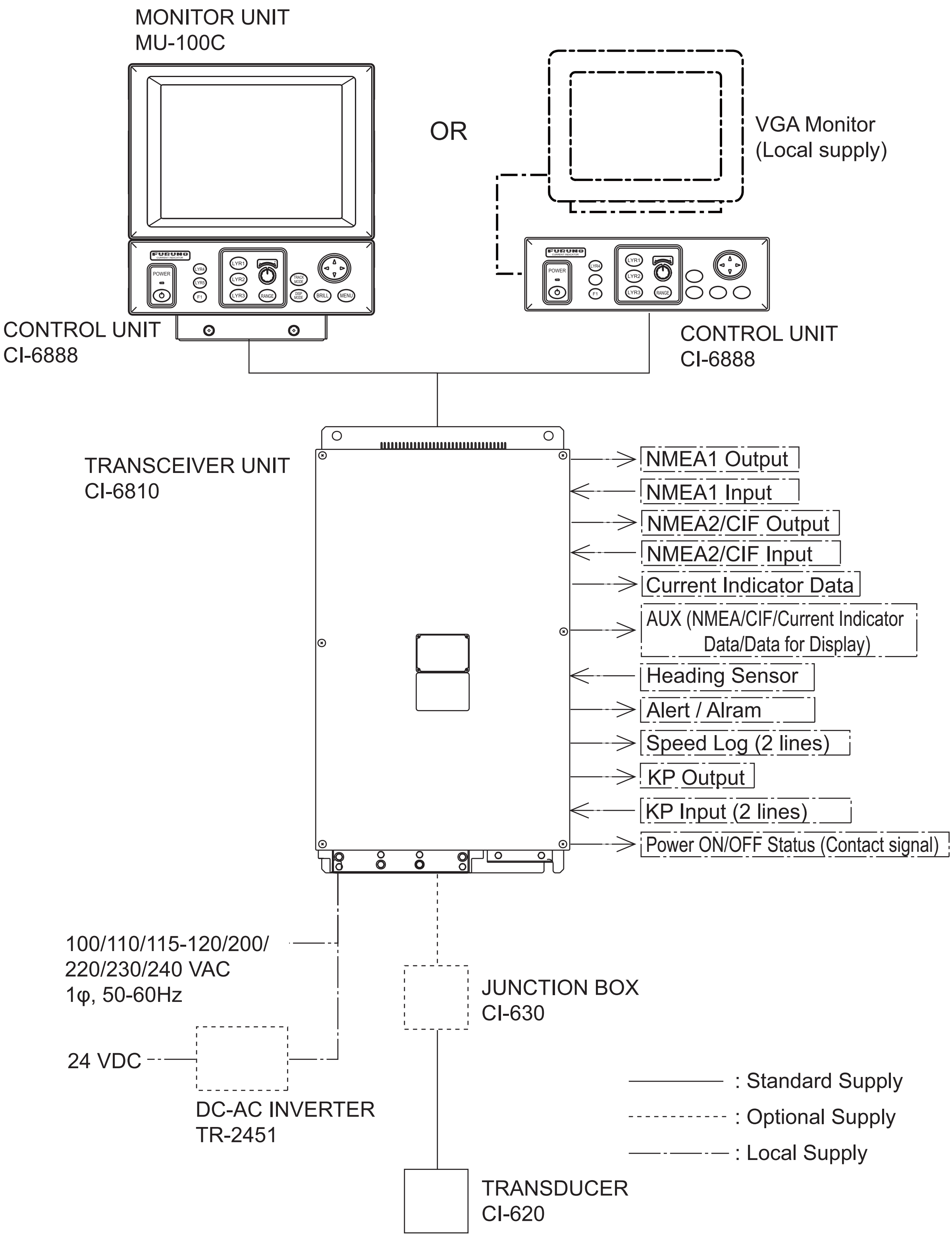
The transducer cable must be handled carefully, following the guidelines below. Keep fuels and oils away from the cable. Locate the cable where it will not be damaged.

Ground the equipment to prevent electrical shock and mutual interference.

Observe the following compass safe distances to prevent intereference to a magnetic compass:

	Standard compass	Steering compass
Transceiver unit	2.00m	1.30m
Control unit	0.30m	0.30m
Monitor unit	0.80m	0.55m

SYSTEM CONFIGURATIONS



EQIUIPMENT LISTS

Standard Supply

Name	Type	Code No.	Qty	Remarks	
Control/Monitor Unit	CI-6888/MU-100C	-	1 set	w/display unit	
Control Unit	CI-6888	-		no display unit	
Transceiver Unit	CI-6810	-	1		
Transducer	CI-620-1-68	-	1 set	w/10 m cable	Select one.
	CI-620-2-68	-		w/20 m cable	
Transducer Casing	CI-620-T-F	-	1		
Thru-Hull Pipe	CI-620-K-F	-	1		
Installation Materials	CP66-01600	000-070-017	Choose one.	Between trans-ceiver and con-trol units	10 m
	CP66-01610	000-070-018			20 m
	CP66-01620	000-070-019			30 m
	CP66-01630	000-070-020			50 m
	CP66-01501	006-917-660	1	For transducer unit	
	CP66-01504	006-917-350	1	For transceiver unit	
	CP66-01503	006-916-750	1	For display unit	
Accessories	FP02-05100	000-012-474	1	FP06-01102, FP02-05101	
Spare Parts	SP66-00801	006-916-730	1	For control unit	
	SP66-00800	000-070-002	1	For control/monitor unit, w/SP06-01101, SP66-00801	
	SP66-00802	006-917-330	1	For 100 VAC	For trans-ceiver unit
	SP66-00803	006-917-340		For 200 VAC	

Optional Supply

Name	Type	Code No.	Qty	Remarks	
Junction Box	CI-630	-	1 set	w/CP66-00703	
Cable (4P)	Z-6FVNV-SX-C 3P+1P	000-146-086	Choose one.	For junction box	5 m
		000-146-087			10 m
		000-146-088			15 m
		000-146-089			20 m
		000-146-090			30 m
Cable Assembly	66S1239*5M*	000-148-493	1	Between display unit and control unit	
	66S1239*10M*	000-148-498			
Accessories	FP06-01120	006-556-260	1 set	For fixing control unit, Box type	
	FP66-00601	006-916-680		For fixing control unit, V-type	
Transducer Casing	CI-620-T-S	-	1 set	For steel ship	
Thru-Hull Pipe	CI-620-K-S	-	1 set	For steel ship	
DC-AC Inverter	TR-2451	-	1 set		
Multi-Purpose LCD Display	MU-100C	-	1 set		
Control unit flush mount kit	OP06-18	006-556-320	1		

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1. INSTALLATION OVERVIEW

The Doppler Sonar Current Indicator CI-68 consists of a monitor unit (not supplied with black box type), control unit, transceiver unit, junction box and transducer (hull unit). To obtain absolute tide even in deep waters, the CI-68 must be supplied with the speed/course data (or position data) from navigation equipment (GPS) and heading data from a gyrocompass (via an A-D converter). The equipment can output ship's speed and true bearing data to a radar or scanning sonar for true-motion display. Further, current data can be output to an echo sounder or scanning sonar in CIF format.

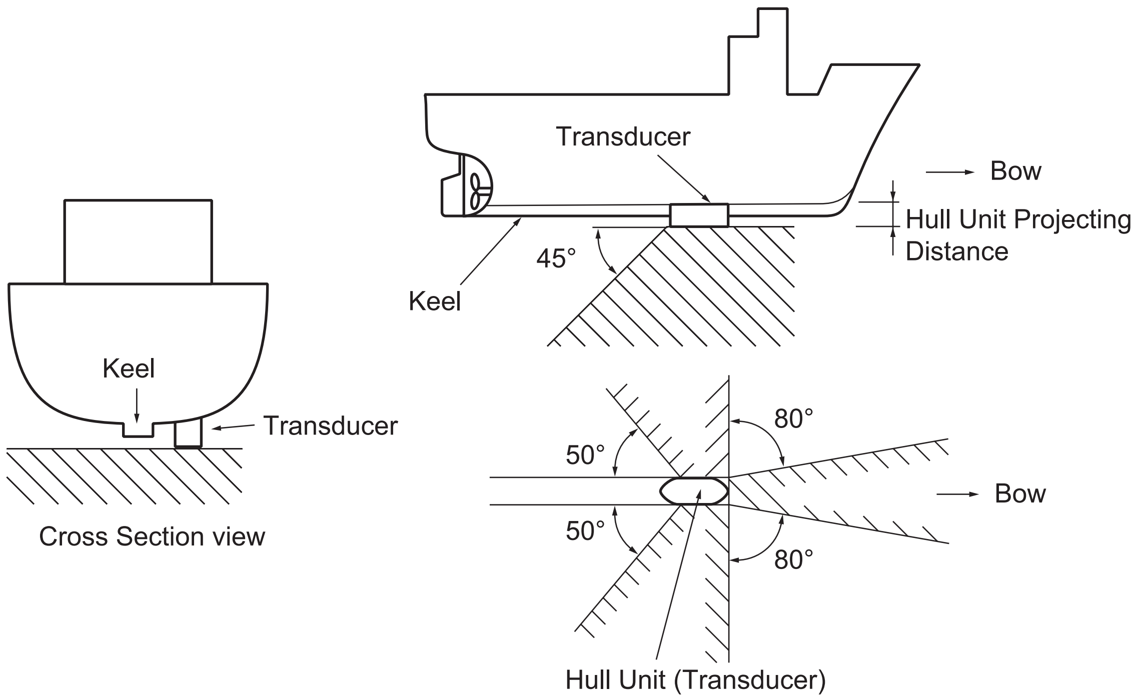
To obtain full performance from the equipment, the installation of the units, especially the hull unit, is very important. Poor siting of units or poor cable layout may cause pick-up of noise, or give interference to other units. This chapter presents an overview of how to install the equipment.

1.1 Selection of Installation Site for Transducer

Transducer （Hull tank）

The performance of the equipment largely depends on the installation of the transducer unit, and a very important consideration is the installation site. It should meet the following requirements.

a) No projections (such as sonar's retraction tank) should exist in the hatched area shown below. However, when the transducer projects below the lowest part of the keel, the effects when the sonar transducer is lowered must be taken into account.



Transducer, mounting location

b) Mount the transducer at a location between one-third and one-half of the ship's full length (measuring from the bow). Select a place where the transducer is free from

the effects of air bubbles. The transducer face should not be above the sea surface when the ship is pitching or rolling.

c) In general, the air bubbles produced at the bow flow backward alongside the keel. Therefore, separate the transducer by more than 1000 mm from the keel, or flush mount the transducer inside the keel.

d) The surface of the transducer should project by 250 mm or more from the hull bottom. For better performance, its surface should be even with the keel's lowest point or below it.

e) The following is important for preventing interference between the CI-68 and other equipment. If the transducer of an echo sounder or scanning sonar whose harmonic is within the frequency range of 236 kHz to 252 kHz (244±8 kHz) is mounted, interference may occur. Even if the harmonic is out of the range, the risk of interference still exists if the transducer of the CI-68 and other equipment are mounted near one another. For this reason, separate the transducer of the CI-68 as far as practical from other equipment which have high output power. If interference is unavoidable due to limited mounting space, connect the interfering equipment to the built-in interference rejection circuit (two inputs) in the transceiver unit. For connection to this circuit, you will need to run a two-cores cable between it and the interfering equipment.

f) Make the transducer cable as short as possible. The cable is generally installed in grounded steel conduit run between the transducer and the junction box, to prevent pick-up of noise. The transducer with the 20 m transducer cable can be used only when it is passed inside conduit.

NOTE

Do not transport the transducer by pulling the transducer cable.

The internal wiring may be cut.

⚠ WARNING

Install the specified transducer tank in accordance with the installation instructions. If a different tank is to be installed the shipyard is solely responsible for its installation, and it should be installed so the hull will not be damaged if the tank strikes an object.

The tank or hull may be damaged if the tank strikes an object.

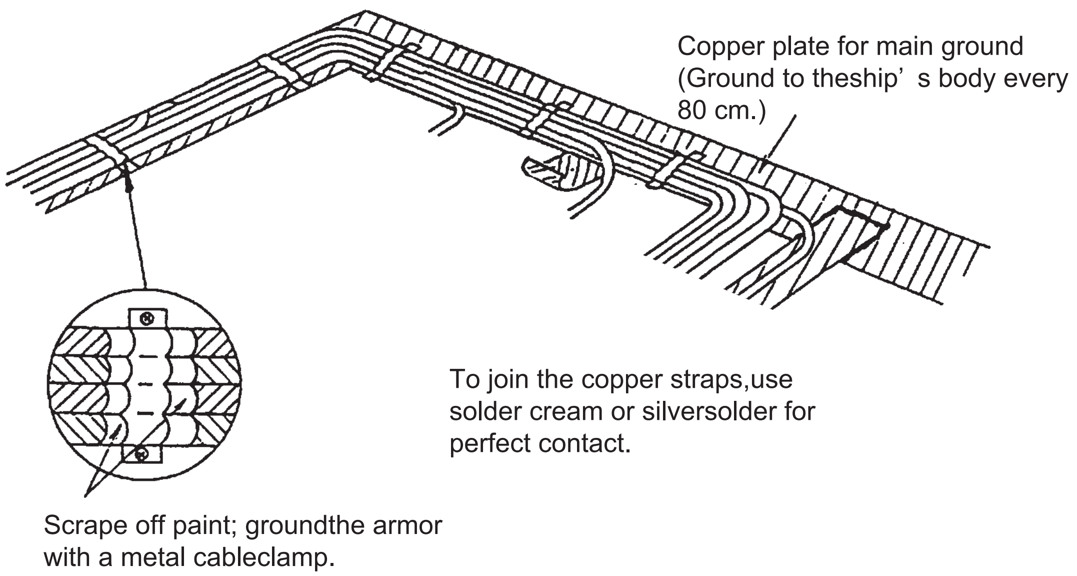
If a steel tank is installed on an FRP vessel, take appropriate measurements to prevent electrolytic corrosion.

Electrolytic corrosion can damage the hull.

1.2 Ground

This equipment uses pulse signals which may cause interference to other electronic equipment such as a direction finder and radio receiver, if it is not grounded properly. It is strongly recommended to ground all cables referring to the guidelines below.

a) Separate all units as far as possible from radio equipment.
b) Do not run interconnection cables close to or near radio equipment or its cables.
c) Run the cables in the shortest path practical.
d) Lay the cables on grounded copper plate and fix them every 300 mm with metal cable clamps.
e) Ground all units as shown in the figure below and on the next page.
f) To join copper straps, use solder cream for perfect contact.

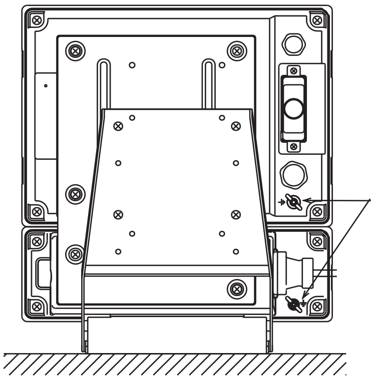


Example of ground

<u>Location of earth terminal on each unit and grounding method</u>

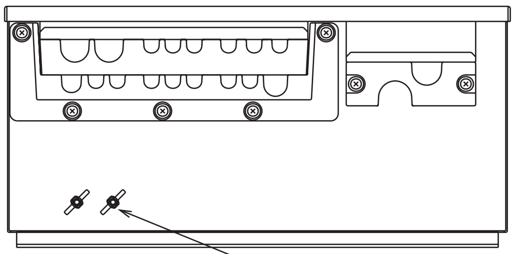
⚠ CAUTION
Ground the equipment. Ungrounded equipment can give off or receive electromagnetic interference or cause electrical shock.

Monitor unit/Control unit

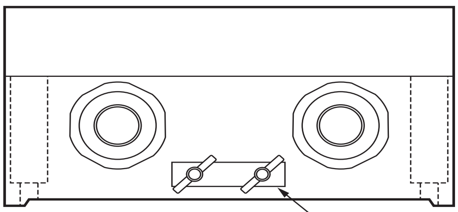


Transceiver unit

This protection earth should be grounded securely.



Junction box



Location of ground terminals

1.3 Changing Power Supply Voltage

1ϕ, 50/60 Hz AC power is supplied to the transceiver unit. The transformer tap is set at the factory according to customer's order. If necessary, change jumper wires at the terminal board of the transceiver unit according to the input voltage.

⚠ WARNING

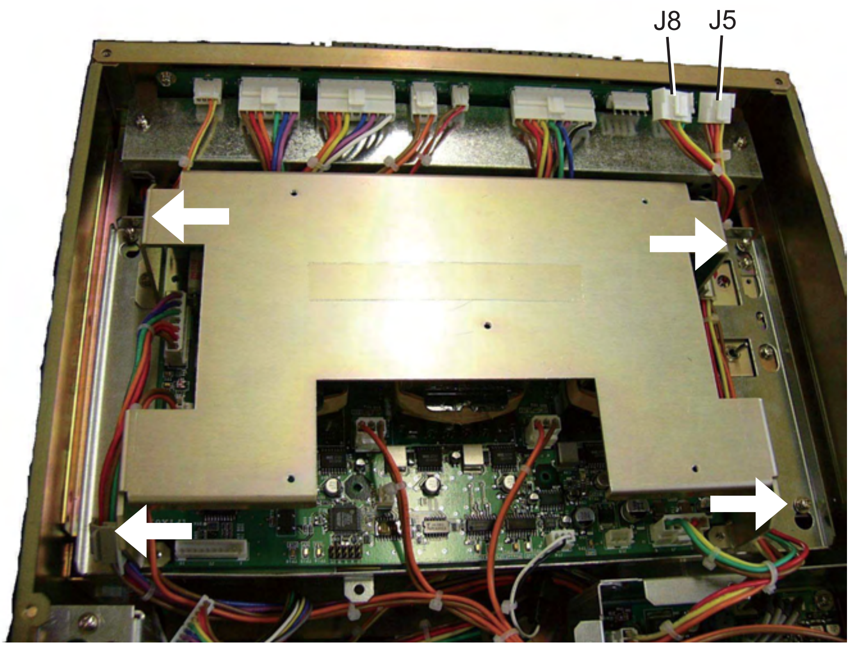
Turn off the power at the power supply before opening the cover.

Fire or electrical shock can result if the power is left on.

Use the correct fuse.

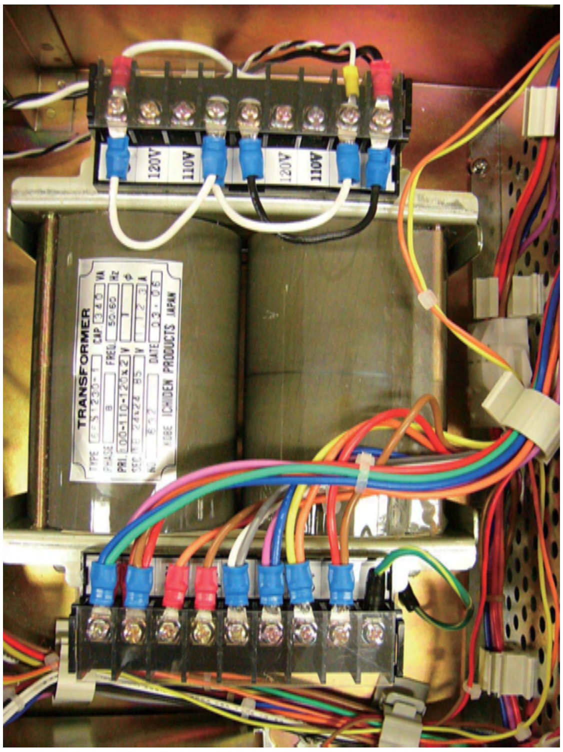
Use of wrong fuse can result in damage to the equipment.

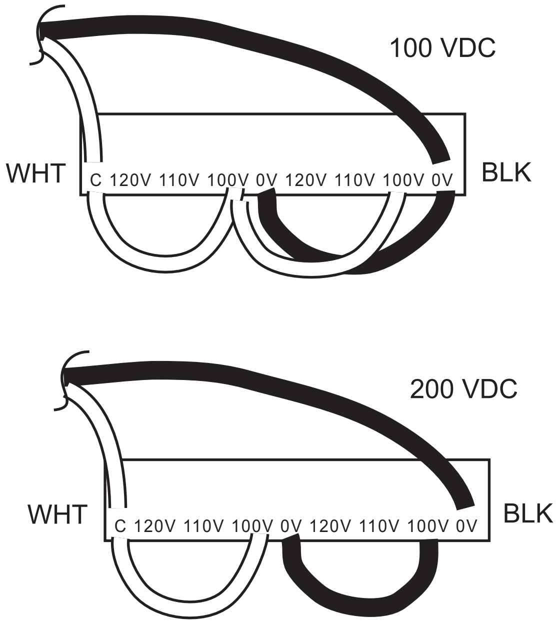
1. Remove the cover from the transceiver unit.
2. Disconnect the connectors J5 and J8 from the board at the upper of the transceiver unit.



3. Unfasten four screws shown with arrows in above to remove the PTX6 Board.

4. Arrange jumper wires depending on the input power voltage, referring to the next page.





Trans wiring

For other voltages, see the sticker attached at inside of the transceiver unit. Also, exchange the FUSE 1 and FUSE 2 fuses as below.

	FUSE1	**FUSE2**
100 VAC	FGBO 5A AC250V	FGBO 5A AC250V
200 VAC	FGBO 3A AC250V	FGBO 3A AC250V

Note: After changing the power voltage, check the appropriate box on the above sticker according to the voltage.

2. MOUNTING

2.1 Monitor Unit/Control Unit

⚠ WARNING

Turn off the power at the switchboard before beginning the installation.

Fire or electrical shock can result if the power is left on.

NOTICE

Do not apply paint, anti-corrosive sealant or contact spray to coating or plastic parts of the equipment.

Those items contain organic solvents that can damage coating and plastic parts, especially plastic connectors.

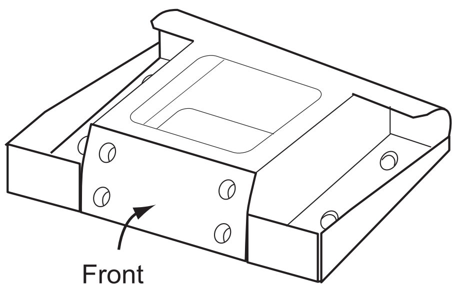
The monitor and control units can be installed as one unit or two separate units. The optional “separate monitor unit installation kit” is necessary when installing them as separate units. See "Mounting the control unit separately" on page 2-3. Further, these units can be mounted in a panel (requires optional flush mount kit), together or separately. See the outline drawings at the back of this manual for details.

- Locate the units out of direct sunlight and hot air.
- The operator should face the bow while viewing the display screen.
- Select a location where the display screen can be easily observed while operating the control unit.
- Environmental temperature should be -15 to 55°.
- Select the place well-ventilated.
- Locate the units at the place with minimal vibration.
- Keep the unit away from the magnetic field.
- Leave sufficient space around the units for maintenance and servicing. Recommended maintenance space appears in the outline drawing at the back of this manual.

Desktop mounting

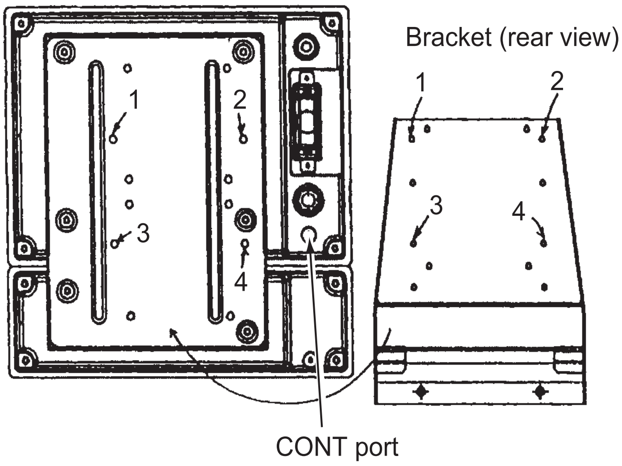
<u>Monitor unit and control unit</u>

1. Fasten the mounting base to the mounting location with four tapping screws (5x20).



Mounting base

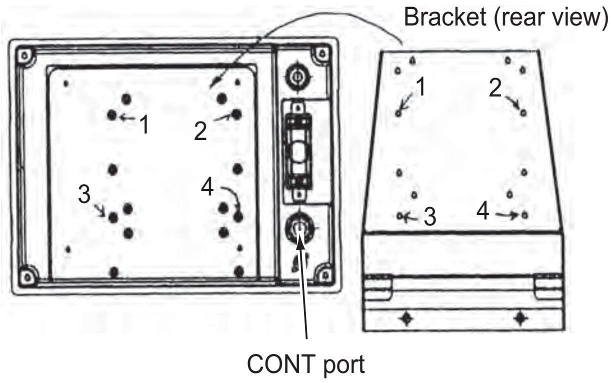
2. <u>Mounting the monitor unit together with the control unit</u>
   Fasten the hanger at the rear of the monitor unit with four binding screws (M4x10).



Hanger (landscape-type)

<u>Mounting the monitor unit separately from the control unit</u>

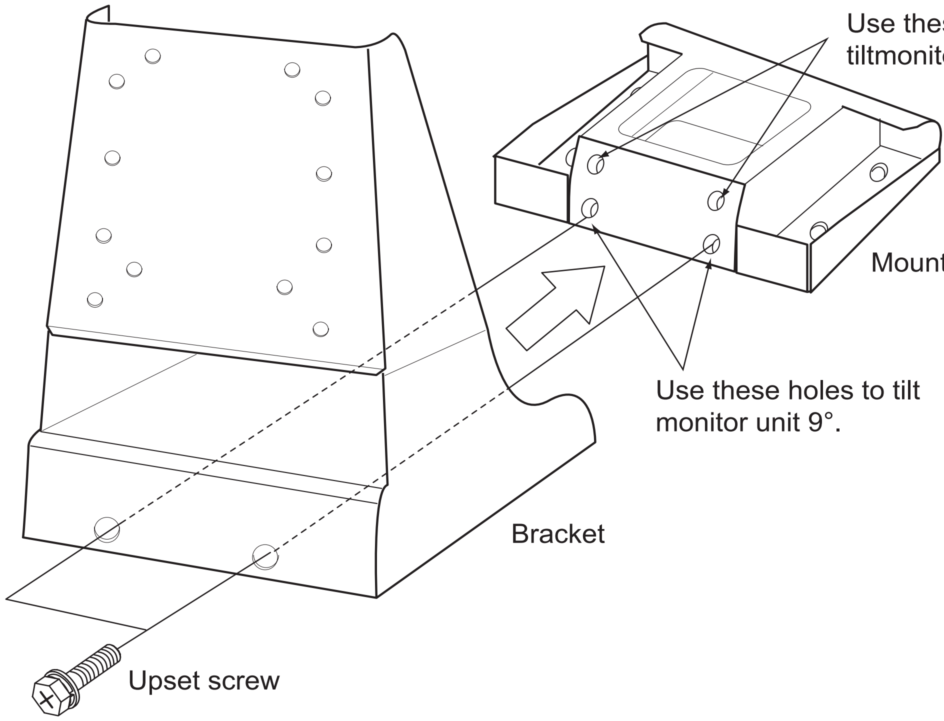
1) Dismount the coupling plate from the rear of the monitor unit to separate the monitor unit from control unit.
2) Attach the hanger at the rear of the monitor unit with four binding screws (M4x10).



Monitor unit, rear view

3. Grease threads of upset screws (M6x16, 2 pcs.) used to fasten the hanger to the mounting base.
4. Attach the waterproofing cap (MJ-A10C, supplied as the installation materials) to the CONT port at the back of the monitor unit.

5. Fasten the hanger (or monitor unit) to the mounting base with two upset screws. (Use the upper holes to tilt the monitor unit 20°; lower holes to tilt it 9°.)



Mounting the control unit separately

To mount the control unit separately or without the monitor unit, one of the following accessories (option) is required.

Type: FP66-00601, Code No.: 006-916-680

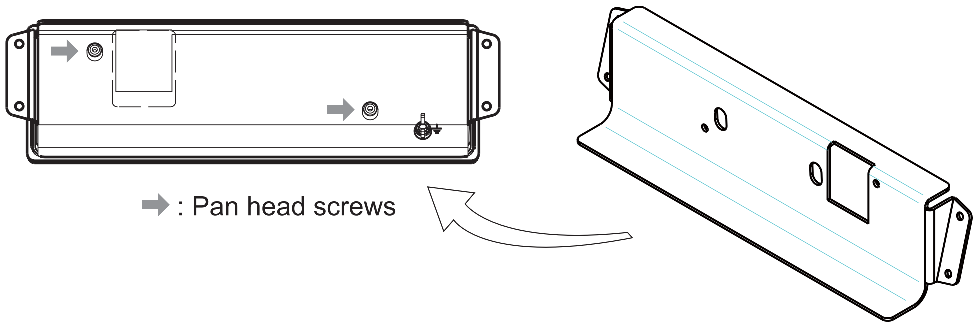
Name	Type	Code No.	Qty
Bracket	66-030-3021	100-307-800	1
Tapping screw	4x16 SUS304	000-802-080	4
Pan head screw	M4x10 C2700W	000-881-964	2

Type: FP06-01120, Code No.: 006-556-260

Name	Type	Code No.	Qty
Mounting plate	06-021-2111	100-279-740	1
Bracket	06-021-2112	100-281-880	1
Tapping screw	5x20	000-802-081	2
Hex. screw	M4x12	000-882-040	4
Hole plug	DP-687	000-808-417	2

Using the FP66-00601

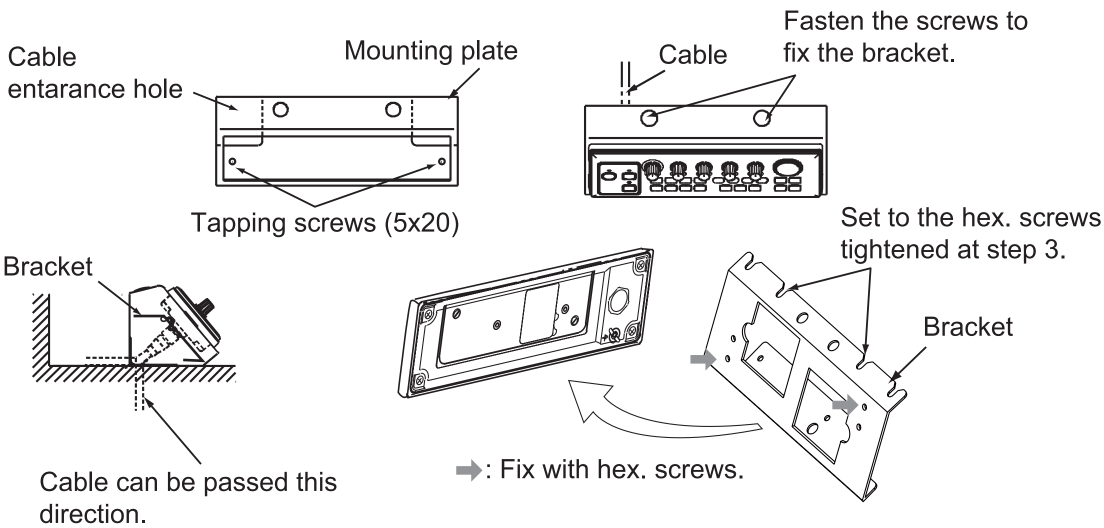
1. Fasten the bracket to the control unit, using two pan head screws (M4x10).



2. Fasten the bracket to the mounting location with four 4x16 tapping screws.

Using the FP06-01120

1. Fasten the mounting plate to the mounting location with two 5x20 tapping screws.
2. Fix the bracket to the control unit with two hex. screws (M4x12).
3. Insert screwdriver from the top of the mounting plate holes and then loosely fasten two hex. screws (M4x12).



Mounting the control unit

4. Attach the control unit to the mounting plate and then tightly fasten two hex. screws.
5. Attach two hole plugs to the holes at the top of the mounting plate.

Flush mounting

See the outline drawing at the back of this manual.

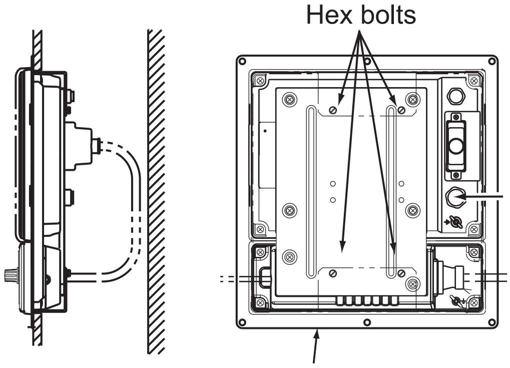
Monitor unit/control unit

The optional flush mount kit OP06-16 is required.

Type: OP06-16, Code No.: 006-556-300

Name	Type	Code. No.	Qty
Fixing metal	06-021-1311	100-279-611	1
Tapping screw	5x20	000-802-840	6
Hex. bolt	M4x12	000-882-040	4

1. Cut out hole in mounting location referring to the outline drawings at the back of this manual.
2. Fasten the fixing metal to the monitor and control units with four hex. bolts (M4x12).



Monitor unit/control unit, rear view

3. Attach the waterproofing cap (MJ-A10C, supplied as installation materials) to the CONT port at the back of the monitor unit.
4. Using four tapping screws (5x20), fasten the fixing metal attached at step 2 to the mounting location.

Monitor unit

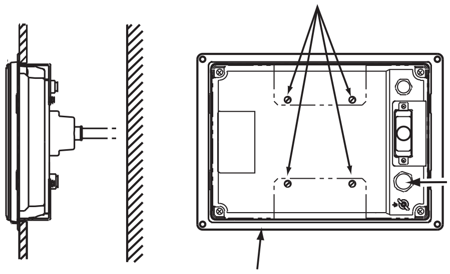
For flush mounting of the monitor unit, the following optional kit is required.

Type: OP06-17, Code No.: 006-556-310

Name	Type	Code No.	Qty
Fixing metal	06-021-1321	100-279-622	1
Tapping screw	5x20	000-802-840	4
Hex. bolt	M4x12	000-882-040	4

1. Cut out a hole (H207xW287) in the mounting location referring to the outline drawings at the back of this manual.

2. Fasten the fixing metal to the monitor unit with four hex. bolts (M4x12).



Monitor unit, rear view

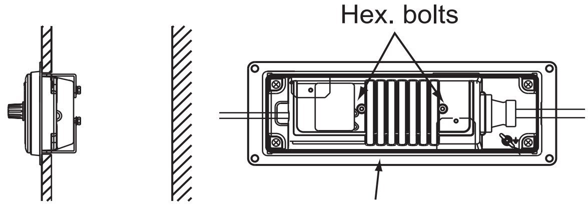
3. Attach the waterproofing cap (MJ-10C, supplied as the installation materials) to the CONT port at the back of the monitor unit.
4. Using four tapping screws (5x20), fasten the fixing metal attached at step 2 to the mounting location.

Control unit

Type: OP06-18, Code No.: 006-556-320

Name	Type	Code No.	Qty
Fixing metal	06-021-2101	100-279-731	1
Tapping screw	5x20	000-802-840	4
Hex. bolt	M4x12	000-882-040	2

1. Cut out a hole in the mounting location referring to the outline drawings at the back of this manual.
2. Fasten two hex. bolts (M4x12) to fix the fixing metal to the control unit.



3. Fasten four tapping screws (5x20) to fix the control unit to the mounting location.

Blackbox type

Supply monitor and interconnection cable (D-sub connector, three rows of 15 pins, max. length 15 m) locally. The monitor connects to the control unit, and should satisfy the specifications shown below.

Note: The D-sub connector with two rows of 15 pins cannot be used.

VGA type

- Analog RGB, 0.7 Vpp, positive polarity
- TLL level H, V, negative polarity

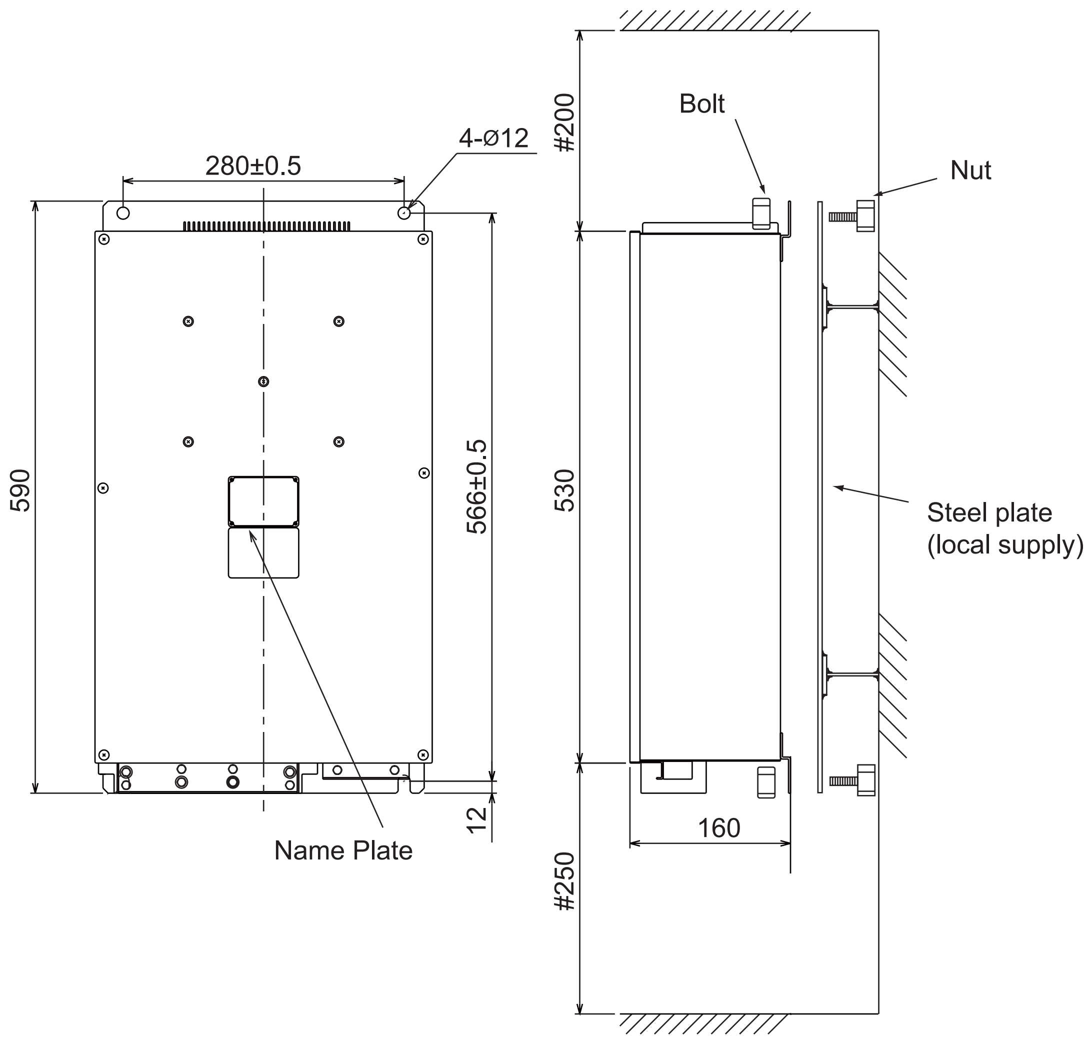
2.2 Transceiver Unit

Mounting considerations

- Since the transceiver unit generates heat, install it in a dry, well-ventilated place. The cooling fans at the top of the unit must not be obstructed, to allow heat to escape.
- This unit is designed for bulkhead mounting to permit dissipation of heat. If bulkhead mounting is absolutely impossible, mount the unit on the floor leaving at least 50 mm clearance between it and the floor to permit dissipation of heat.
- This unit weights 19 kg. Reinforce the mounting area, if necessary.
- Leave space around the unit for maintenance and checking. Refer to the drawing at the back of this manual.

Mounting procedure

1. Weld the steel plate (shipyard supply) with four mounting holes to the bulkhead.
2. Use four bolts and nuts (M10, supplied as installation material) to fix the transceiver unit to the steel plate described at step 1.



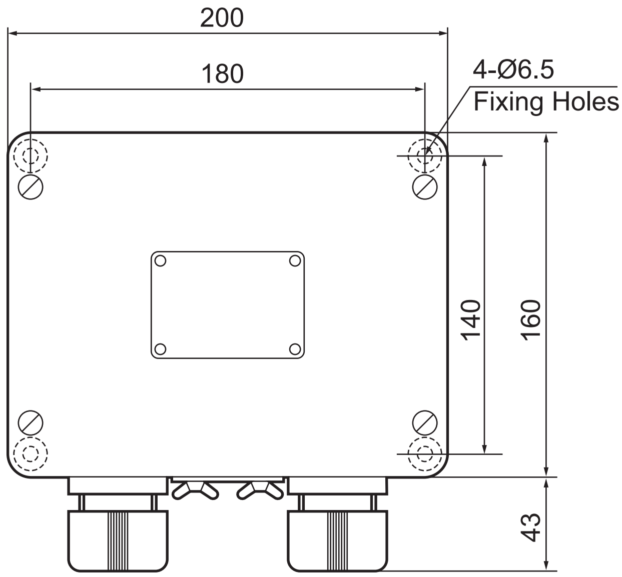
Transceiver unit, mounting dimensions (mm)

2.3 Junction Box (option)

Mounting considerations

The junction box forms a joint between the transducer and the transceiver unit. Install it referring to the guidelines below.

- Keep the junction box away from noise-emitting electrical machinery, i.e., electric generator, radio transmitter, TV, etc.
- Although the box is splashproof, do not install it in places of high humidity.
- Avoid installing the box where temperature varies greatly, since moisture may penetrate the box.
- The box is generally installed above the draft line of the ship and the transducer cable is run inside steel conduit. This permits replacement of the transducer without dry docking.
- Even if the junction box is installed below the draft line, the conduit is necessary to avoid picking up noise. If use of conduit is not possible, install the box as near to the transducer as possible.



Junction box, mounting dimensions (mm)

Mounting procedure

Fix the junction box to a bulkhead, referring to the figure above for mounting dimensions.

2.4 Transducer (Hull Unit)

See chapter 1 to mount the transducer.

NOTE

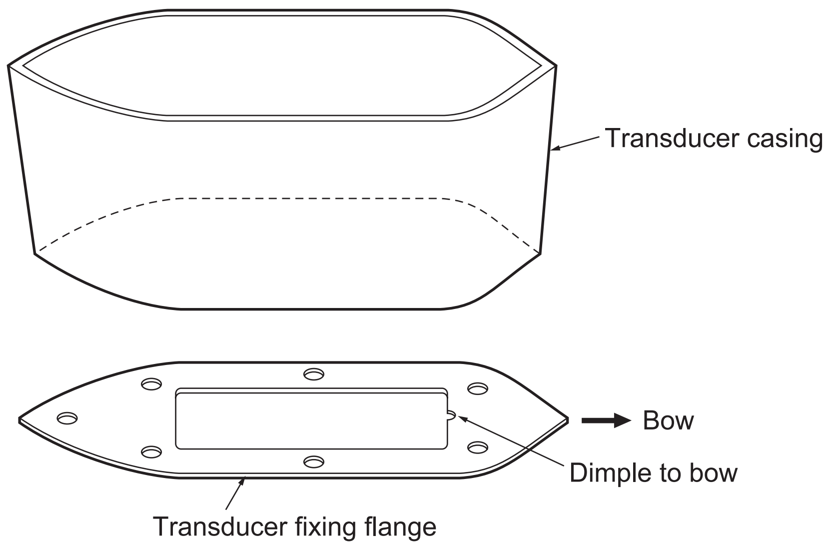
Do not transport the transducer by pulling the transducer cable.

The internal wiring may be cut.

Mounting the transducer for steel hull vessels

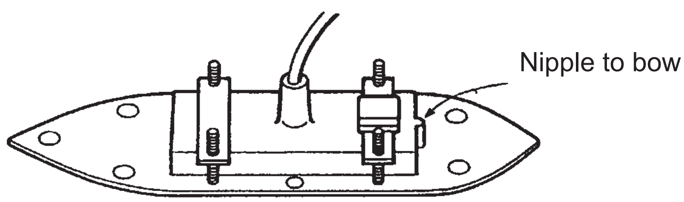
To mount the transducer for steel hull vessels, the optional transducer casing (CI-620-T-S) and thru-hull pipe (CI-620-K-S) are required.

1. Select a mounting place on the hull bottom. (Since the transducer cable is comparatively thick, select a mounting place for the thru-hull pipe where the cable can be easily led into the cable gland.)
2. If necessary, weld a doubling plate (shipyard supply) to the hull bottom to reinforce the hull.
3. Unpack the transducer casing and determine the projecting length, making it 250 mm or more. Before cutting the casing, note that the transducer casing has fore-aft direction. Then, cut it considering the rising angle of the ship's hull.
   Note: Weld the casing in parallel with ship's fore-aft line with an accuracy of better than ±1°. The transducer face should be horizontal at cruising speed.
4. Make a hole for the thru-hull pipe in the hull bottom. Before welding the thru-hull pipe, remove the rubber packing from the thru-hull pipe. Weld the thru-hull pipe. Replace the rubber gasket.
5. Make a hole of 10 to 20 mm diameter on the stern side of the casing to allow water to penetrate the transducer casing.
6. Weld the casing to the hull bottom. Do not remove the transducer fixing flange to prevent the casing from being deformed.



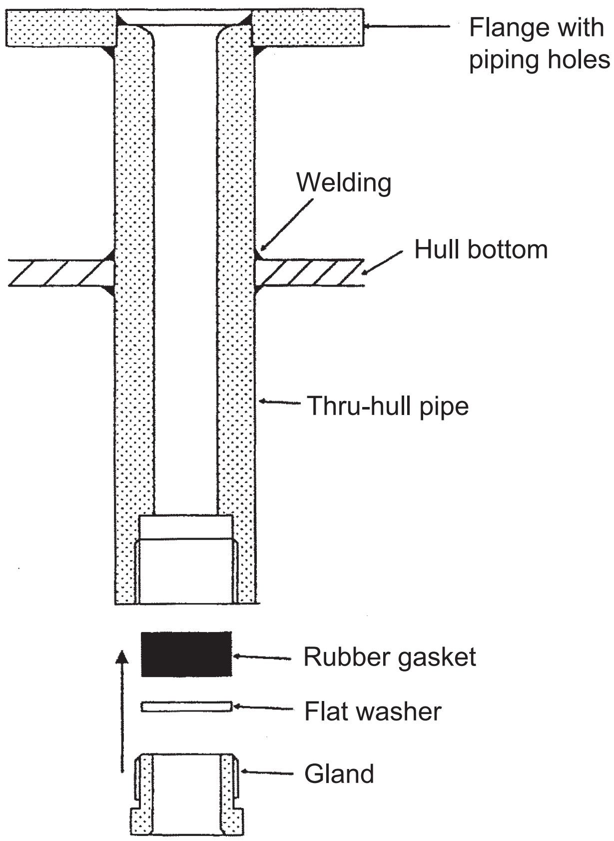
Fixing transducer casing

7. Dismount the fixing flange from the casing. Fix the transducer to the fixing flange.



Fixing flange

8. Pass the transducer cable through the thru-hull pipe. Tighten the cable gland, leaving 0.5 to 1 m of slack in the cable below the cable gland.



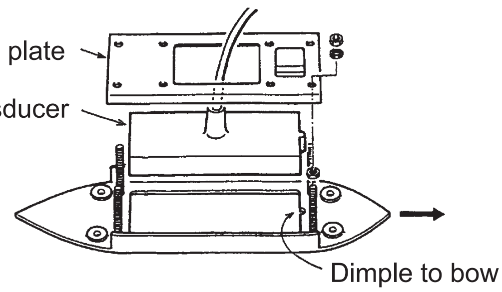
Thru-hull pipe for steel hull

9. Mount the fixing flange with the transducer onto the casing. Take care not to pinch the transducer cable. Never hold the transducer by the cable. Shock will most assuredly damage the transducer.

Mounting the transducer for FRP hull vessels

1. Select a mounting place on the hull bottom. (Since the transducer cable is comparatively thick, select a mounting place for the thru-hull pipe where the cable can be easily led into the cable gland.)
2. Determine the projecting length of the casing, making it at least 250 mm. Cut the casing, considering the rising angle of the ship's hull, so that the transducer face is horizontal.
   Note: The casing should be parallel with ship's fore-aft line within ±1°, and the transducer face should be horizontal at cruising speed.
3. Make a hole of 10 to 20 mm in diameter on the stern side of the casing to allow water to penetrate the transducer casing.
4. Make a hole for the thru-hull pipe on the hull bottom. Allow enough clearance around the pipe for easy tightening of lock nuts.
5. Fix the thru-hull pipe on the hull plate with double nuts and then apply FRP glue around the pipe.
6. Before fixing the casing to the hull bottom, clean the hull plate surface with an electric sander until fiberglass appears, then remove dusts, oils, etc. from surface. Reinforce both sides of the casing with FRP molding.

7. Fix the transducer to the fixing flange.

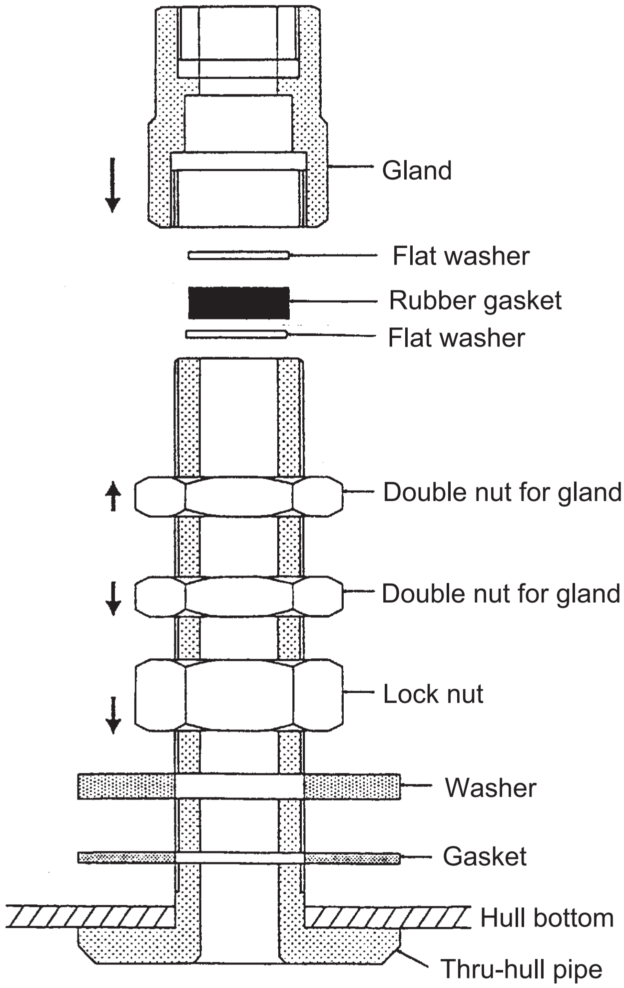


Transducer and fixing flange

8. Pass the transducer cable through the thru-hull pipe. Tighten the cable gland, leaving 0.5 to 1.0 m of slack in the cable below the cable gland.

   To tighten the cable gland

   1) Tighten the gland securely by using the wrench.
   2) Tighten the double nut securely.



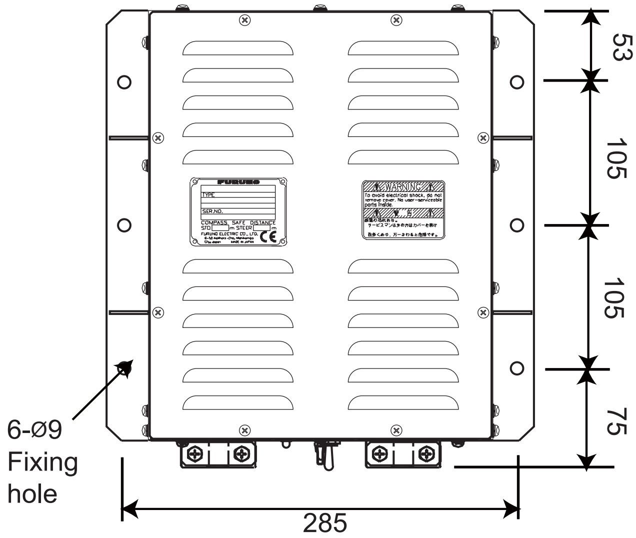
Thru-hull pipe, side view

9. Fix the fixing flange with the transducer to the casing. Take care not to pinch the transducer cable.

2.5 DC/AC Inverter

If the power supply is 24 VDC, the DC-AC inverter is required. This unit is designed for the bulkhead mounting and weights 15 kg, reinforce the mounting location if necessary. The cable entrances must be faced downward.

Note: Mount this unit in a well-ventilated place to prevent heat build up inside the cabinet.



DC-AC inverter, mounting dimensions (mm)

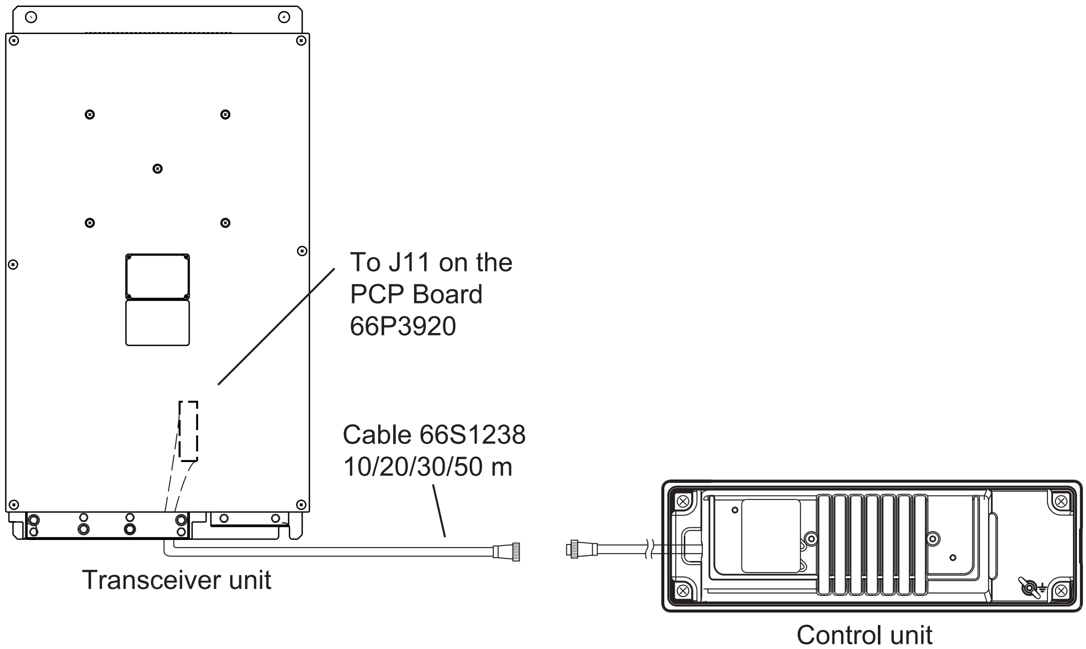
3. WIRING

See the interconnection diagram at the back of this manual.

3.1 Wiring the Control Unit

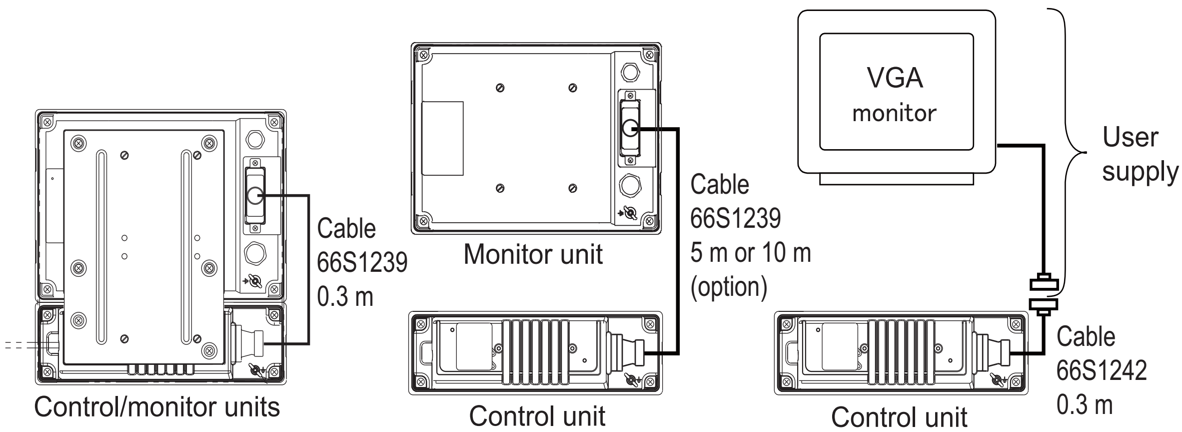
3.1.1 Connection with the transceiver unit

Attach the connector of the control unit to the cable (66S1238) from the transceiver unit as below.

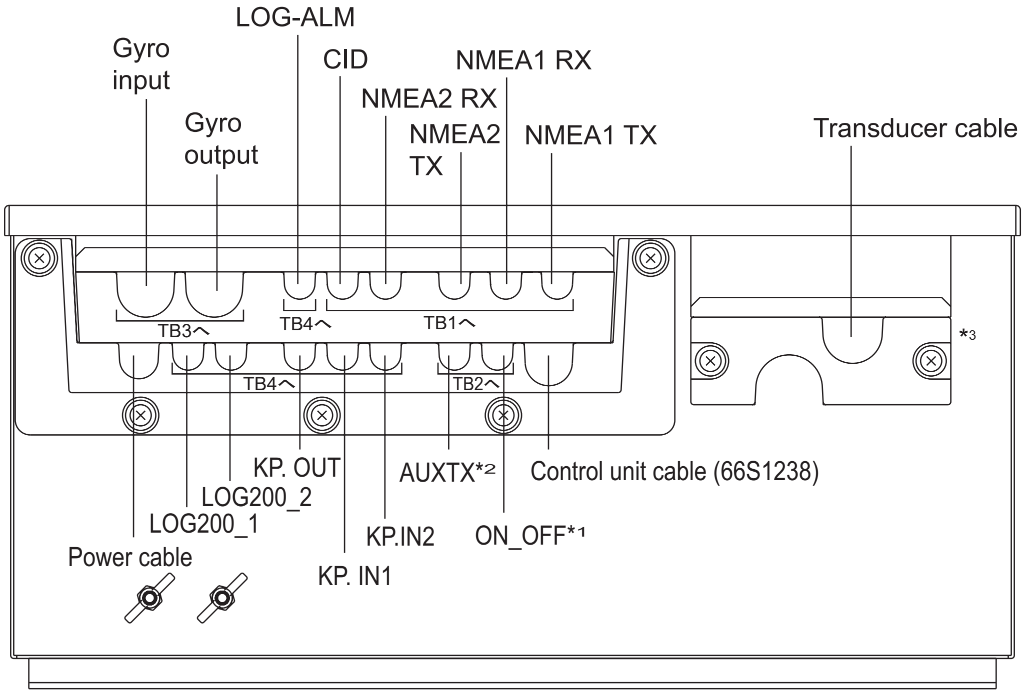


3.1.2 Connection with the monitor unit

Choose one from the follows to connect the control unit and monitor unit (VGA monitor).



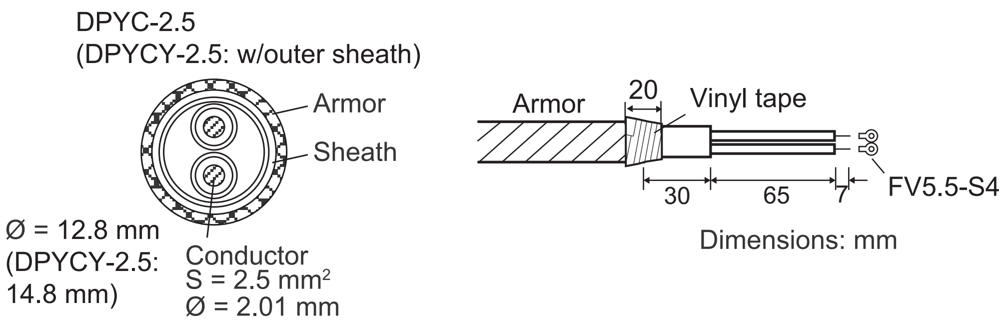
3.2 Wiring the Transceiver Unit



*1: Contact alarm signal
*2: CIF/NMEA/Current
*3: When connecting the cable from the junction box, reverse the direction of the clam

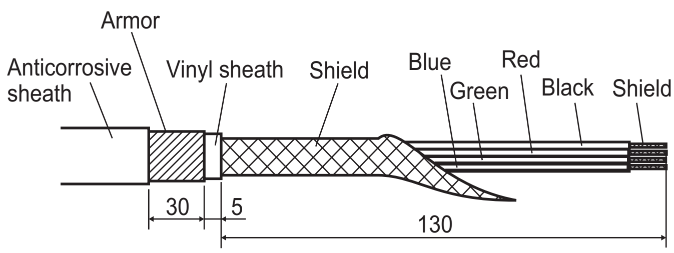
Transceiver unit, bottom view

Fabricating DPYC-2.5 and DPYCY-2.5 (Japanese Industrial Standards) or equivalent cable



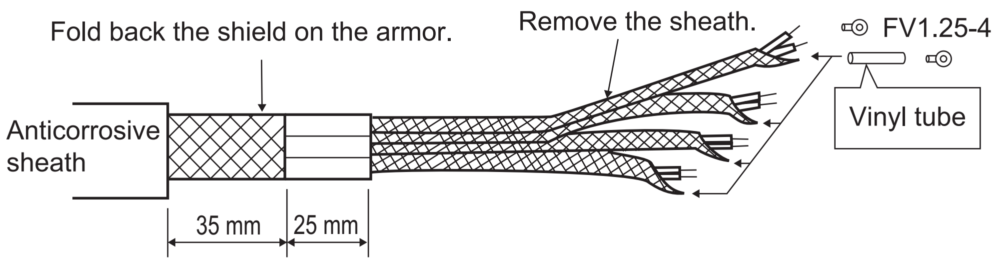
Power cable DPYC-2.5 or DPYCY-2.5

Fabricating 4P cable (66S1067, from the junction box)

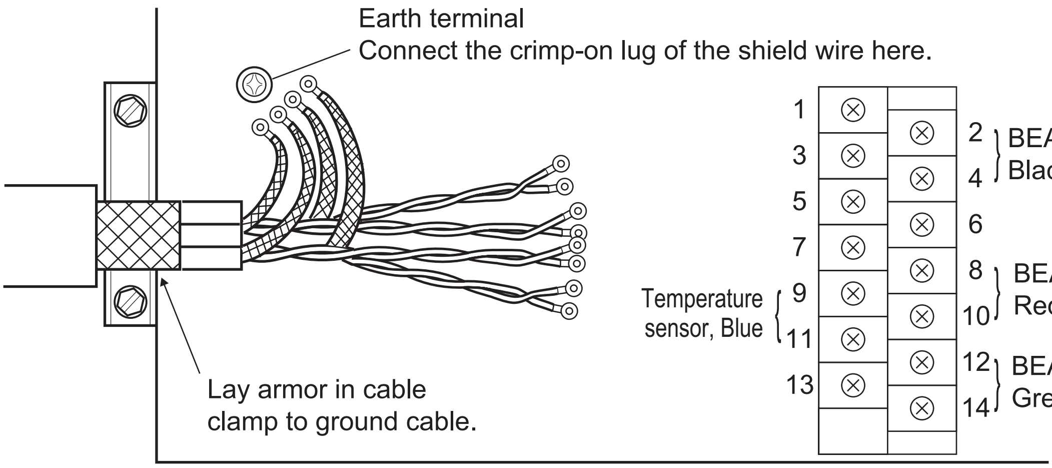


NOTE

Carefully connect the wires to respective terminals, referring to the illustrations and the interconnection diagram. Wrong connection can damage the transducer.

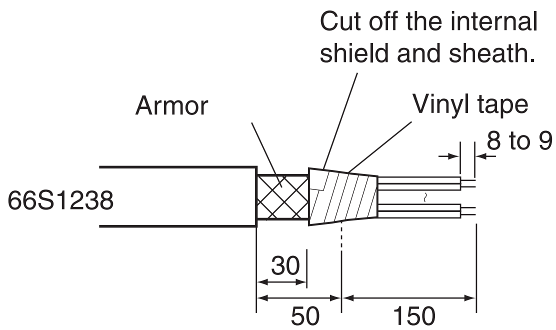


Transducer cable 1



Transducer cable 2

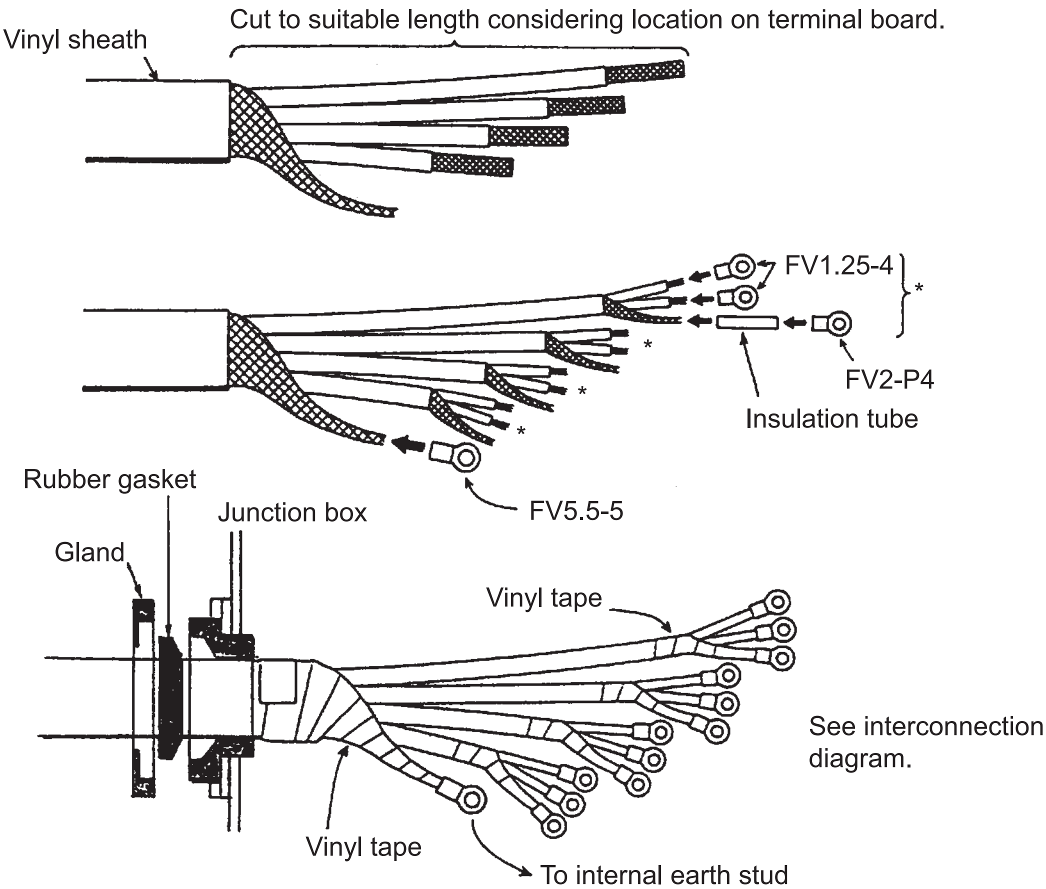
Fabricating of the control unit cable (66S1238)



3.3 Connecting the Junction Box

The transducer cable is connected to the junction box with an extension cable. After making the connection, seal the cable gland with putty for watertightness.

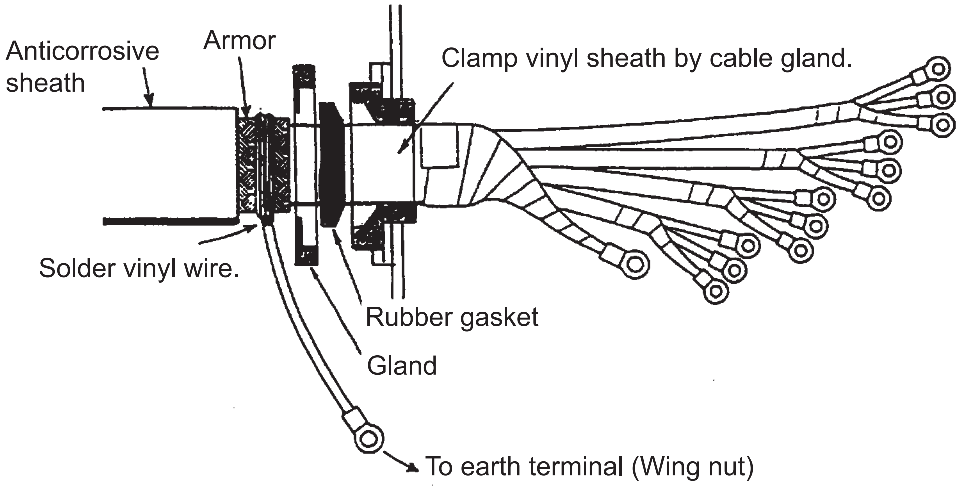
Transducer cable (66S1066, no armor)



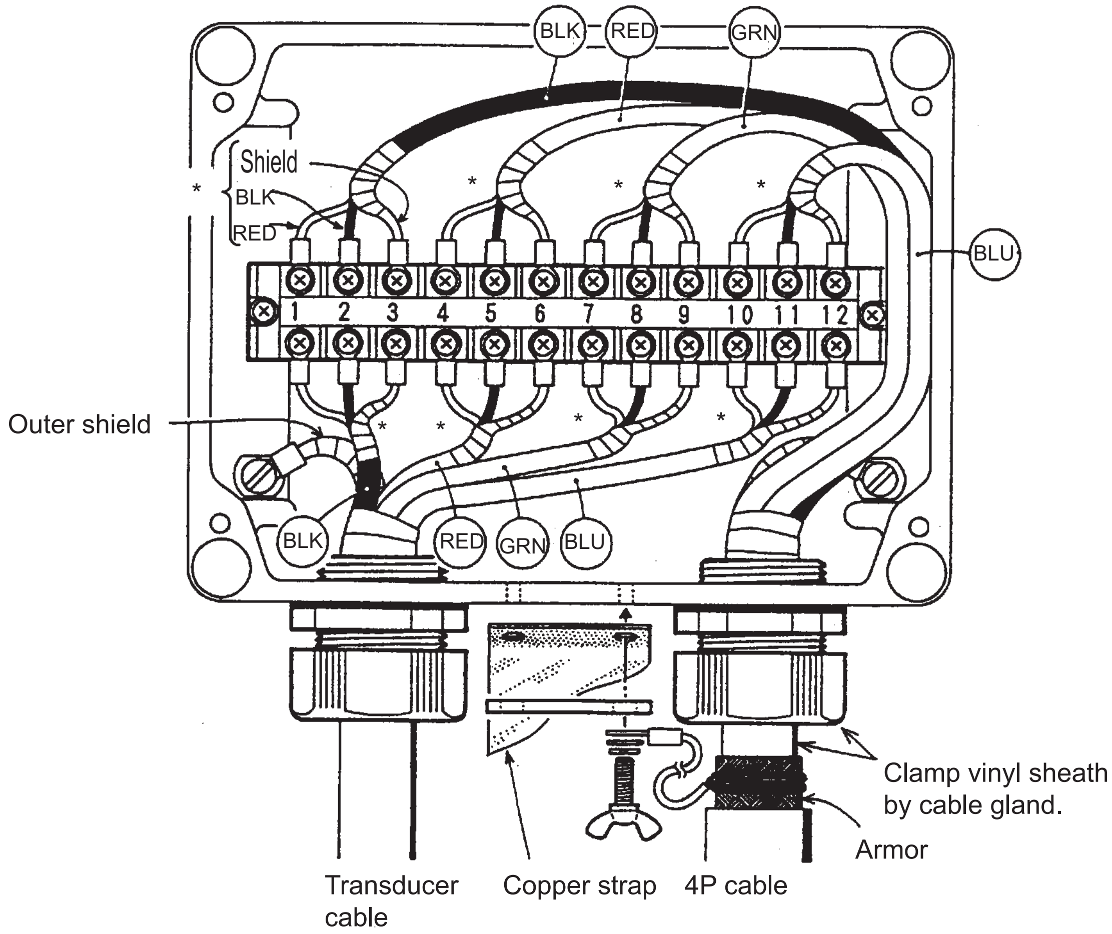
Transducer cable (no armor)

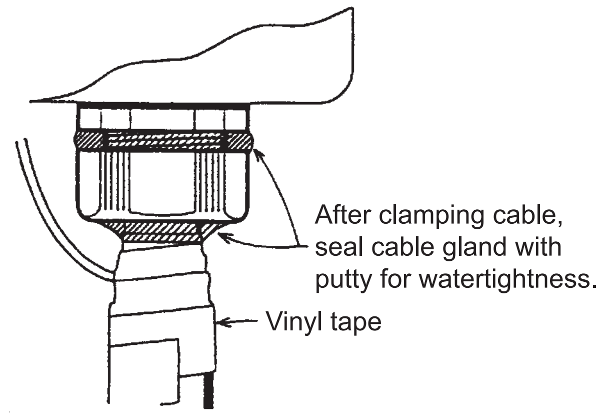
4P pair cable (66S1067, extension cable, with armor)

Attach crimp-on lugs in the same manner as shown above. Fabricate the armor as follows.



4P cable (w/armor)



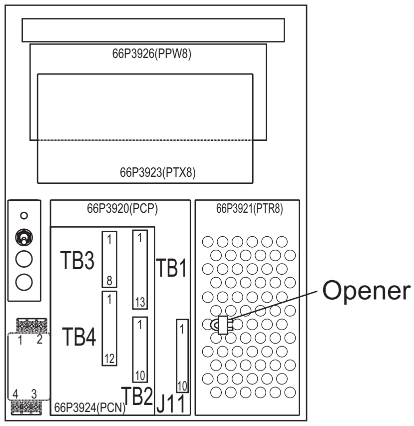


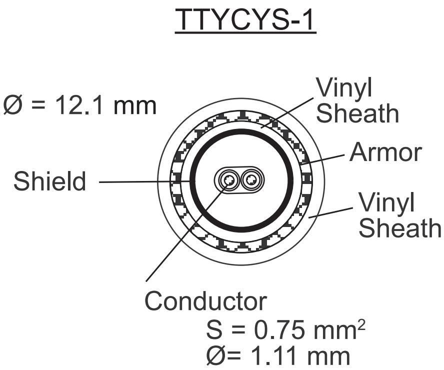
Junction box, inside view

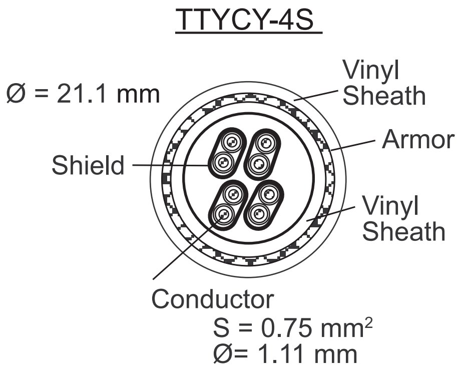
3.4 External Equipment

A gyrocompass, NMEA equipment, LOG pulse and KP signal are connected to the transceiver unit. Use the connectors attached to the PCN Board (66P3924) in the transceiver unit. Also, the opener is supplied as installation materials for the transceiver unit.

The right figure is the internal view of the transceiver unit.

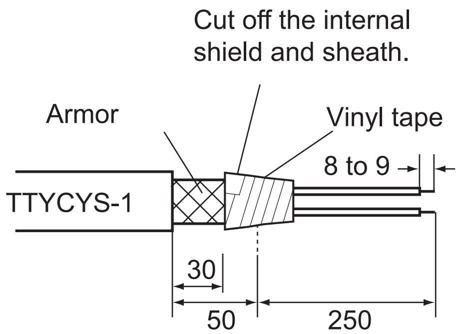






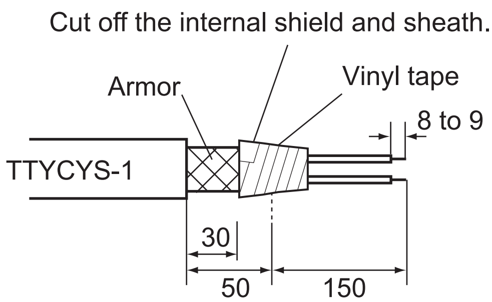
TB1

Use TB1 to transmit/receive NMEA and current indicator's signal.



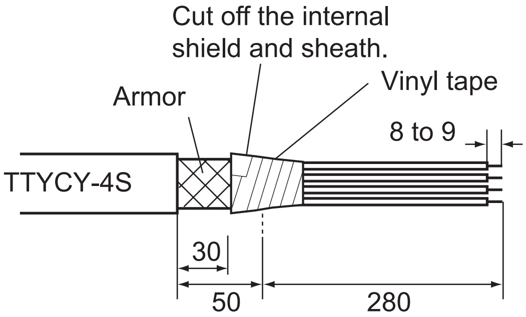
TB2

Use TB2 to output RS-422 (ship's speed, current data etc.) and power ON/OFF (contact signal).



TB3

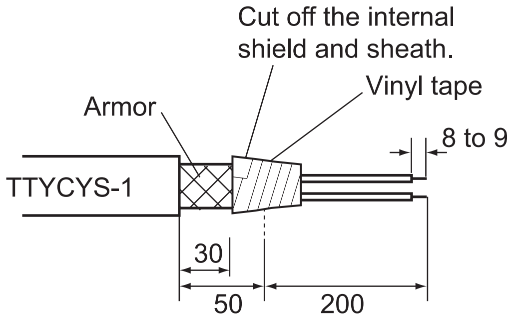
Use TB3 to input/output GYRO signal.

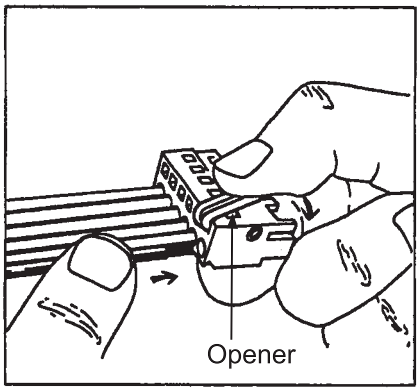


TB4

Use TB4 to input/output the following signal.

- Alarm signal Output
- Log signal Output
- KP signal Input
- KP signal Output



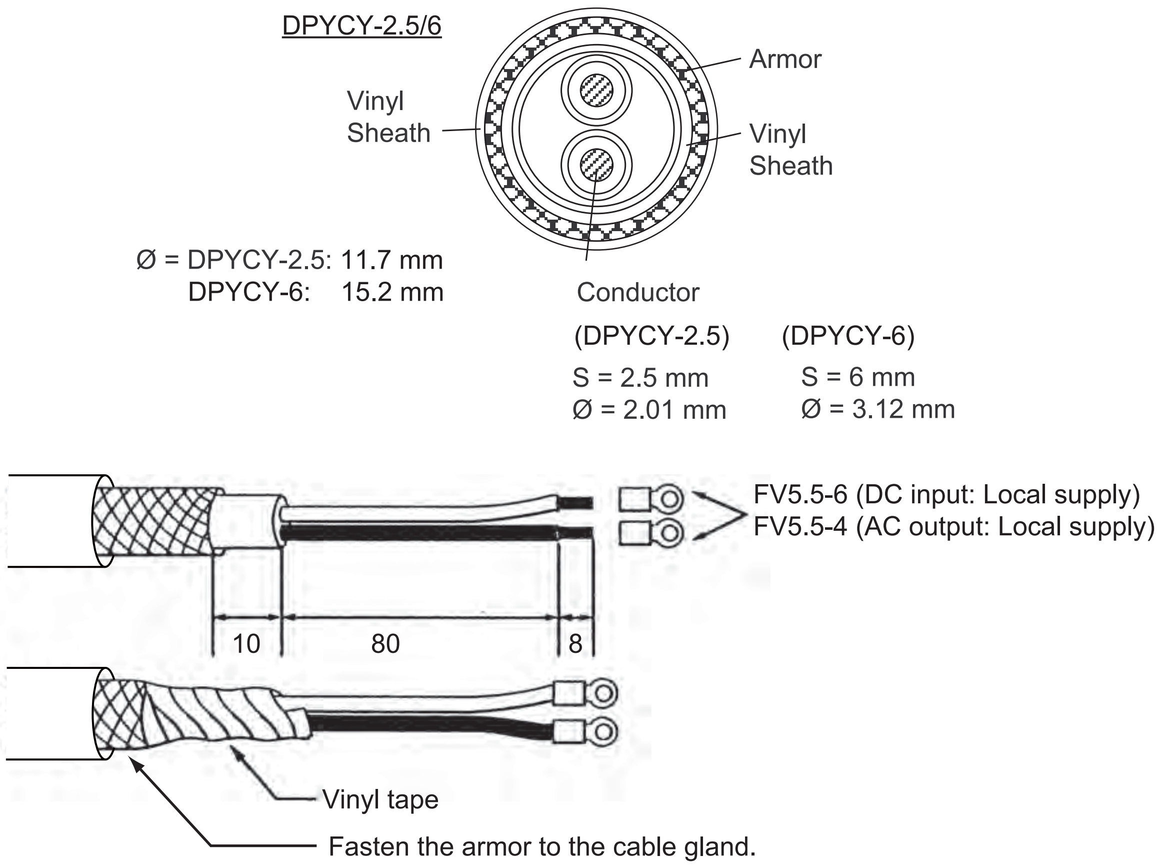


1. Attach the opener to the connector.
2. Push the opener.
3. Insert the cable core.
4. Release the opener.

How to attach cable core to the connector

3.5 DC/AC Inverter

Use the DPYCY-6 (Japanese Industrial Standards) cable to connect the DC-AC inverter from the ship's power supply within 5 m. For outputting 100VAC, use the DPY-CY-2.5 cable.



4. ADJUSTMENTS

4.1 [INSTALLATION] menu

4.1.1 [I/O] sub menu

1. Press the **MENU** key.
2. Press ▲ to move the cursor to the top of the menu.
3. Press ▶ several times to show the message "PRESS FUNC KEY TO OPEN INSTALLATION MENU."
   Note: Press the **MENU** key to open the menu other than the INSTALLATION menu.
4. Press the **F1** key and then select [INSTALLATION].
5. Press ▼.
6. Press ◀ to select [I/O].

MENU 1 MENU 2 ALARM [INSTALLATION]

[I/O] CALIB OTHER

NMEA VERSION	:	1.5	2.0	[3.0]	IEC61162
NMEA PORT 1					
BAUD RATE	:	[4800]	38400		
NMEA2/CIF					
FORMAT	:	[NMEA]	CIF		
NAV SOURCE	:	[AUTO]	GPS	LORAN-C	
NAV DATA	:	[SPD]	L/L		
TIME INTERVAL*	:	[1 min]			
HEADING DEVICE	:	[NO]	YES		
FORMAT**	:	[AD-10]	NMEA		
HDG OUT > 0.5kn	:	[COG]	HEADING		
HDG OUT < 0.5kn	:	[COG]	HEADING		
LOG PULSE MODE	:	[GT/WT]	WT		
LOG PULSE OUT	:	FORE	[FORE/AFT]		
TIDE OUT INT	:	[15 sec]			
TEMP SENSOR	:	NO	[YES]		

MENU ON INSTALLATION SETTINGS.

[▲/▼]:SELECT, [◀/▶]: CHANGE, [MENU]: EXIT

* Shown when [NAV DATA] is set to [L/L].
** Shown when [HEADING DEVICE] is set to [YES].

***[I/O]** sub menu*

<u>NMEA VERSION</u>

Choose NMEA version of sentences which are output from the NMEA 1 port and NMEA2/CIF port. The choices are NMEA 1.5, 2.0 and 3.0, and IEC61162. The input sentences do not require NMEA version.

<u>NMEA PORT 1 BAUD RATE</u>

Choose baud rate of equipment connected to NMEA 1 port. The choices are 4800 and 38400 (bps).

NMEA2/CIF FORMAT

Choose format of equipment connected to NMEA2/CIF port. The choices are [NMEA] and [CIF]. When selecting [NMEA] here, the sentences are output with the NMEA version selected at [NMEA VERSION]. The baud rate is fixed to 4800 bps. To choose CIF, set the jumper switch J4 on the PCN Board (66P3924) to CIF.

NAV SOURCE

Choose source of nav data among [AUTO], [GPS] and [LORAN-C]. [AUTO] reads position data in order of accuracy: GPS>LC.

NAV DATA

Choose source data for calculation of sea tide in the NAV mode.

[SPD]: Speed data from the GPS navigator is used as ground tracking speed to calculate sea tide.
[L/L]: Position data from the GPS navigator is used as ground tracking speed to calculate sea tide.

TIME INTERVAL

Set the time interval for reading position data to use for calculating speed. Effective when [NAV DATA] above is selected to [L/L]. The choices are 1, 2, 3 and 4 (min).

HEADING DEVICE

Choose [YES] if a heading device is connected to the current indicator. When [YES] is selected, you can choose [HEAD UP] or [NORTH UP] on the [DISP1] sub menu. For selection of [NO], the display mode is fixed to [HEAD UP].

FORMAT

When [YES] is selected at [HEADING DEVICE] above, choose the format of the heading device which is connected to the current indicator. The choices are [AD-10] and [NMEA].

HDG OUT >0.5kn

Choose type of bearing to output when ship's speed is higher than 0.5 kn. The choices are [COG] (Course Over Ground) and [HEADING].

HDG OUT <0.5kn

Choose type of bearing to output when ship's speed is lower than 0.5 kn. The choices are [COG] (Course Over Ground) and [HEADING].

LOG PULSE MODE

Choose the tracking mode to use as source for the log pulse. The choices are [GT/WT] (ground tracking/water tracking) and [WT] (water tracking).

LOG PULSE OUT

Output log pulse in fore direction or both fore and aft directions.

TIDE OUT INT

Choose the output interval for tide data, from among 15 and 30 seconds, and 1, 2, 5 and 10 minutes.

TEMP SENSOR

Choose [YES] if a water temperature sensor is connected to the current indicator.

4.1.2 [CALIB] sub menu

MENU 1 MENU 2 ALARM INSTALLATION

I/O CALIB OTHER

DRAFT	:	0.0m		
HEEL ANGLE	:	0.0°		
TRIM ANGLE	:	0.0°		
GT SPD CALIB	:	0.0%		
WT SPD CALIB	:	0.0%		
BEARING CALIB	:	0.0°		
COURSE CALIB	:	0.0°	(GT: 0.0°	NAV: 0.0°)
CSE CALIB MODE	:	GT	NAV	MANUAL
CSE CALIB EXEC*	:	NO	YES	
SOUND VELOCITY	:	NO	YES	
EXTERNAL KP1	:	0.0m		
EXTERNAL KP2	:	0.0m		

* Shown when [CSE CALIB MODE] is set to [GT] or [NAV].

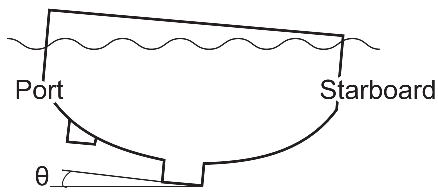
[CALIB] sub menu

DRAFT

Set ship's draft to get depth from draft rather than transducer. (-5 to 25.5 (m))

HEEL ANGLE

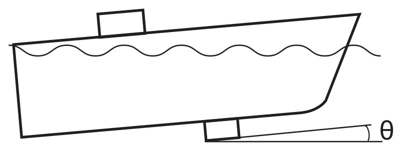
Compensate lateral (port-starboard) inclination of the transducer face. Set [+] angle for port-high state and [-] angle for starboard-high state. (-12.8 to 12.7 (°))



Set to +5.0 when port side is higher than starboard side by five degrees.

TRIM ANGLE

Compensate for fore-aft inclination of the transducer face. Set [+] angle for fore-high state and [-] angle for aft-high state. (-12.8 to 12.7 (°))



Set to +5.0 when port side is higher than starboard side by five degrees.

GT SPD CALIB

Calibrate ship's speed in the ground tracking mode. (setting range: -12.8 to 2.7 (%)) True speed should be calculated at the sea trial. Calibration value is obtained as follows:

$$\text{Calibration value (\%)} = \frac{\text{True speed - (CI-68-measured speed)}}{\text{True speed}} \times 100$$

WT SPD CALIB

Calibrate ship's speed in the water tracking mode. In general, enter the same value as the [GT SPD CALIB]. (-12.8 to 12.7 (%))

BEARING CALIB

Calibrate bearing offset angle of the transducer. When the transducer's fore-aft axis is deviated to starboard from the ship's fore-aft line, set a positive angle. (-30 to 30 (°))

COURSE CALIB

Calibrate course here when the course value in ground tracking mode is different from the external GPS navigator reading though [BEARING CALIB] on the previous page is done correctly. The setting range is -30 to 30 °. The [GT] and [NAV] values next to [COURSE CALIB] show the calibrations of [CSE CALIB MODE] in below.

CSE CALIB MODE

Choose tracking mode to use to calibrate course so that it is the same on both the current indicator and GPS navigator.

[GT]: Enter suitable value so ship's track in the ground tracking mode is the same as that on the NAV mode.
[NAV]: Assuming that the tide near own ship is constant, offset it so tide in fore-aft direction is constant for ten minutes.
[MANUAL]: The course manually entered at [NAV] in [COURSE CALIB].

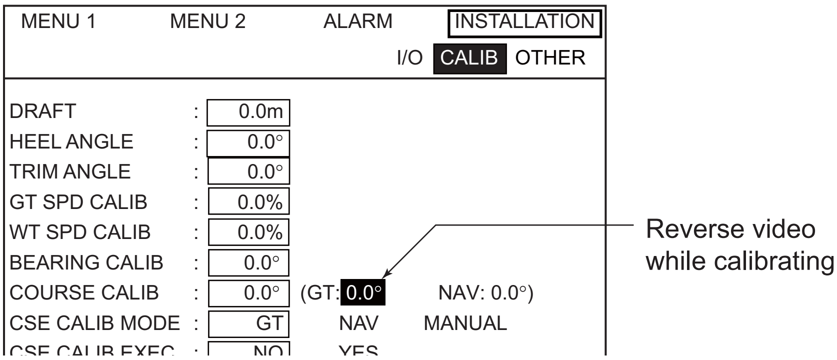
CSE CALIB EXEC

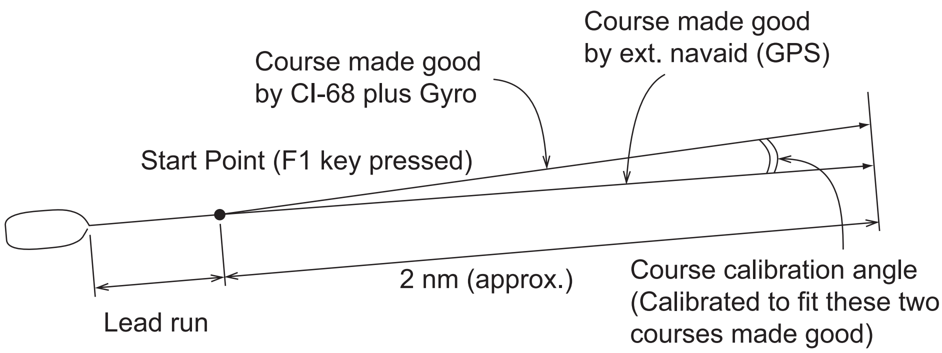
Calibrate course. Choose [GT] or [NAV] from [CSE CALIB MODE] and then choose [YES] here.

When ground tracking is obtainable (Depth is approx. 3 to 300 m)

1. Press the **TRACK MODE** key to choose the ground tracking mode.
2. In the [CALIB] sub menu, to press ▲ or ▼ to choose [CSE CALIB MODE].
3. Press ◀ to choose [GT].
4. Run the vessel at a speed of about 10 kn, keeping heading constant. To minimize gyro speed error, it is desirable to turn along parallels; namely, eastward or westward.
5. Press ▼ to choose [COURSE CALIB EXEC].
6. Press ▶ to choose [YES].
7. Press the **F1** key to start the calibration. As soon as you press the **F1** key, [0.0] on the [COURSE CALIB] line should be shown in reverse video. After you have traveled 2 nm, the display will show the course calibration angle (result of the calibra-

tion) in normal text. (This value is not retained in the memory; it is reset to zero when the power is turned off.)



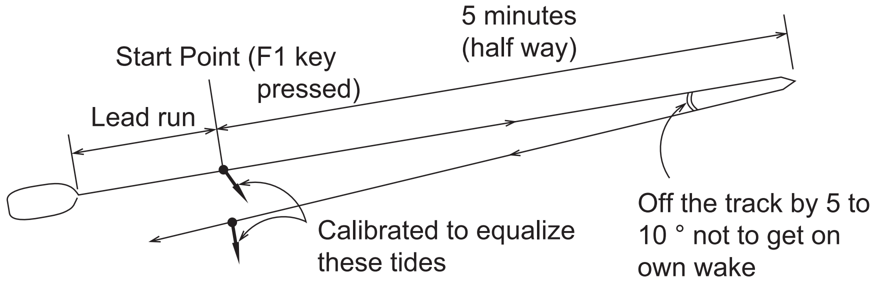


8. Press ▲ to choose [COURSE CALIB].
9. Press ◀ or ▶ to enter the value.
10. Press ▼ to choose [CSE CALIB MODE], and then press ▶ to choose [MANUAL]. The input value for [COURSE CALIB] is only effective when [MANUAL] is selected on the menu.

<u>When ground tracking is not obtainable (Depth is more than 300 m)</u>

1. Press the **TRACK MODE** key to choose the ground tracking mode.
2. In the [CALIB] sub menu, to press ▲ or ▼ to choose [CSE CALIB MODE].
3. Press ◀ or ▶ to choose [NAV].
4. Run the vessel at a speed of about 10 kn for five minutes, keeping heading constant, then return to the starting point.
5. Press ▲ or ▼ to choose [COURSE CALIB EXEC].
6. Press ▶ to choose [YES].
7. Press the **F1** key to start the calibration. As soon as you press the **F1** key, [0.0] on the [COURSE CALIB] line should be shown in reverse video. In about ten minutes (when the calibration is finished), the course calibration angle appears. (This

value is not retained in the memory; it is reset to zero when the power is turned off.)



8. Press ▲ to choose [COURSE CALIB].
9. Press ◀ or ▶ to enter the value.
10. Press ▼ to choose [CSE CALIB MODE], and then press ▶ to choose [MANUAL]. The input value for [COURSE CALIB] is only effective when [MANUAL] is selected on the menu.

SOUND VELOCITY

Choose [YES] to calibrate sound velocity.

EXTERNAL KP1, EXTERNAL KP2

Set distance between transducer of this current indicator and external KP transducer which is connected to the current indicator as an interference source. The setting range is 0.0 - 25.5 (m). Also, set the DIP switch as shown "DIP switch settings" on page 4-11.

4.1.3 [OTHER] sub menu

MENU 1	MENU2	ALARM	INSTALLATION	
		I/O	CALIB	OTHER
DEPTH SOURCE :	INTERNAL	EXTERNAL		
BTM TRACK BEAM :	B1	B2	B3	ALL
PULSE LENGTH :	NORMAL	LONG		
PWR REDUCTION :	OFF	ON		
TEMP UNIT :	°C	°F		
PULSE UNIT :	/nm	/km		
CUR FLOW DIR :	TO	FROM		
BEAM TEST :	OFF			
LANGUAGE :	JAPANESE	ENGLISH		
SIMULATION :	OFF	VARIABLE	FIXED	
RESET SETTINGS :	NO	YES		

*[OTHER] **sub menu***

DEPTH SOURCE

Choose source of depth data, internal or external.

BTM TRACK BEAM

Choose sounding beam to use to detect bottom. The choices are [B1] (Beam 1), [B2], [B3] and [ALL].

PULSE LENGTH

Choose pulse length to use in the water tracking mode. The choices are [NORMAL] and [LONG].

PWR REDUCTION

Choose [LOW] to reduce output power.

TEMP UNIT

Choose unit of temperature measurement from °C or °F.

PULSE UNIT

Choose unit of distance measurement from nm or km.

CUR FLOW DIR

Choose how to display tide data. [FROM] shows the direction from which the current is flowing. [TO] shows the direction the current is heading.

BEAM TEST

Choose the beam to test among beam 1, beam 1-2, beam 1-3 and beam 2-3. Press ◀ or ▶ to choose the beam to test. "NOW TESTING BEAM XX*" (*: XX = beam number being tested) appears when a beam is being tested.

LANGUAGE

Choose the interface language, English or Japanese.

SIMULATION

Turn the simulation mode on or off and choose simulation mode parameters.

[OFF]: Disable the simulation mode.
[VARIABLE]: Feeds simulation mode data from the processor to the control unit.
[FIXED]: Use the user-set speed and tide values.

When you choose [VARIABLE] or [FIXED], the message "PRESS FUNCTION KEY TO EXECUTE." appears. Press the **F1** key to start the simulation mode. For [FIXED] selection, the window to set ship's speed, tide speed (layer 1 to layer 5) and tide direction appears (▲, ▼: set a value, ▶: move a digit). And then press the **MENU** key to finish the setting. The message "LOADING THE SIMULATION DATA" appears during the simulation mode.

RESET SETTINGS

Restore all (except LANGUAGE) default menu settings. Choose [YES] and then press the **F1** key to reset settings. Three beeps sounds when all settings have been reset.

4.2 Input/Output Data

4.2.1 NMEA Input Sentences

NMEA Input Sentences

Talker	Format	Information
**	ZDA	Time (UTC), Date
GP	RMC	GPS ship's speed, Bearing, Own ship's position
LC	RMA	LC ship's speed, Bearing, Own ship's position, Time difference
**	GGA	Own ship's position (L/L), Ship's speed
GP、LC	GLL	Own ship's position (L/L)
GP、LC	VTG	SOG, True course
**	HDT	Heading (True)
**	HDM	Heading (Magnetic)
**	HDG	Heading (Magnetic)
**	DBT	Depth (below the transducer, Ver 1.5)
**	DPT	Depth (Ver 2.0)
**	MTW	Water temperature

**: Not specified.

Priority

- Own ship's position (L/L): GGA>RMC>RMA>GLL
- Ship's speed: VTG>RMC>RMA
- Heading: HDT>HDG>HDM
- Depth: DPT>DBT

4.2.2 NMEA Output Sentences

NMEA Output Sentences

Talker	Format	Information	Interval
VD	VBW	STW, SOG	1 s
VD	VDR	Current direction/speed	3 s
VD	VHW	STW, Heading	1 s
VD	VTG	SOG, Course (True)	1 s
VD	VLW	Trip distance	3 s
VD	CUR	Multiple-layered current	3 s

NMEA output sentences are changeable as below depending on the [NMEA VERSION] setting on the [I/O] sub menu. See "NMEA VERSION" on page 4-1.

NMEA Ver. 1.5: VDR, VHW, VTG, VLW (Trip distance in water tracking mode only)
NMEA Ver. 2.0: VBW, VDR, VHW, VTG, VLW (Trip distance in water tracking mode only)
NMEA Ver. 3.0: VBW, VDR, VHW, VTG, VLW, CUR
IEC 61162-1 Ed 2: VBW, VDR, VHW, VTG, VLW (Trip distance in water tracking mode only)

4.2.3 CIF Input/output sentences

Input sentences

Data No.	Information
11	System Time
24、28	Positioning data (L/L)
44、48	Ship's speed bearing data
57	Depth data
58	Water temperature data

Priority

Information	Priority (No.)
Positioning data	28>24
Ship's speed bearing data	48>44

Output sentences

Data No.	Information	Interval
56	Single-layered current data	3 s
66	Current indicator-measured speed/bearing	3 s
76	Multiple-layered current (by depth)	15 s

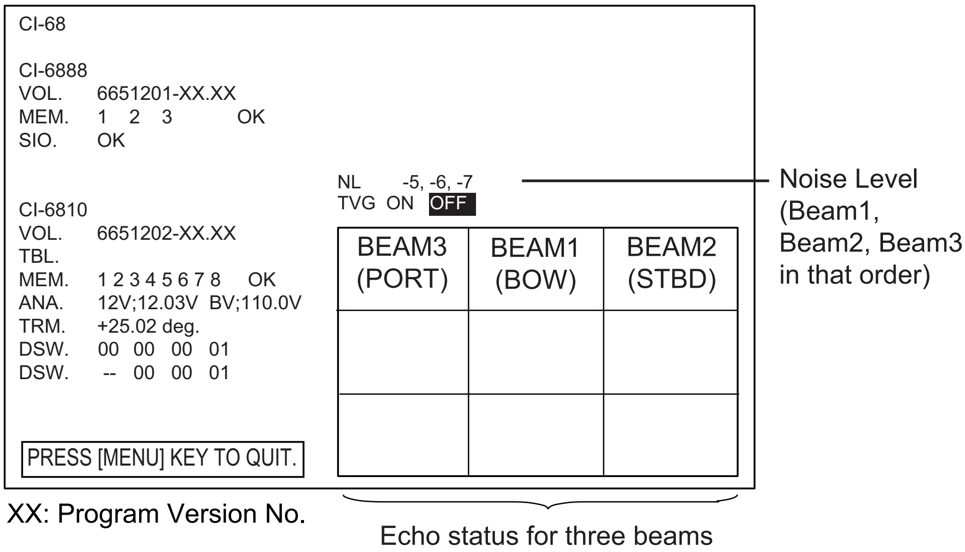
4.3 External Noise and Interference Check

4.3.1 External noise check

Noise level can be measured (without transmission) at the [GENERAL] on the [TEST].

Preparation

1. Press the **MENU** key.
2. Press ▲ to move the cursor to the top of the screen.
3. Press ◀ several times to select [MENU 1].
4. Press ▼ to move the cursor on the sub menu items, and then press ▶ to choose [MENU 4].
5. Press ▼ several times to select [TEST], and press ▶ to choose [GENERAL].
6. Press the **F1** key. If the NL is –5 or more, the unit is receiving affects of interference. In this case, check the following points.
    - Grounding of the transducer unit
    - Noise source around the transceiver unit
    - Distance between the transducer cable and ship's power line.

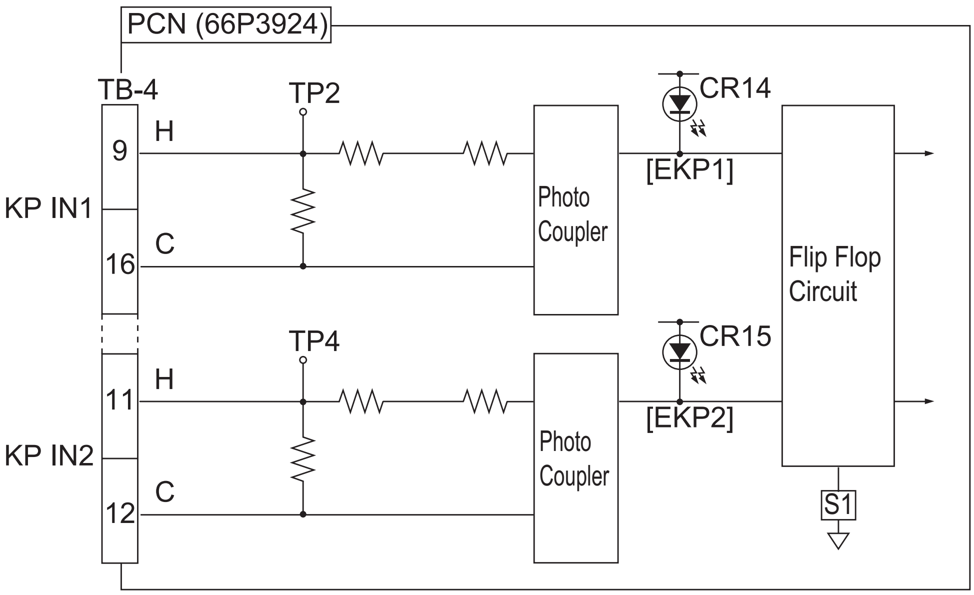


Self test ([GENERAL])

4.3.2 Suppressing interference

<u>Input</u>

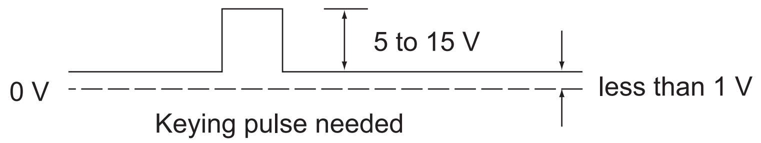
Up to two interfering equipment can be connected to the interference rejection circuit in the transceiver unit via EX KP IN 1 or EX KP IN 2 port. This circuit receives the keying pulse (KP) from the interfering equipment to reject interference.



Interference rejection circuit

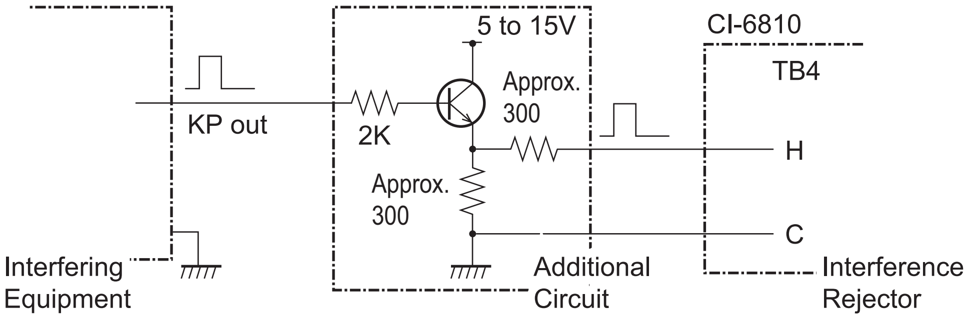
<u>Check of keying pulse</u>

The following keying pulse is required from the interfering equipment. If the level is out of the ratings or KP output circuit is not provided, take the measures shown on the next two pages to prevent equipment malfunction.

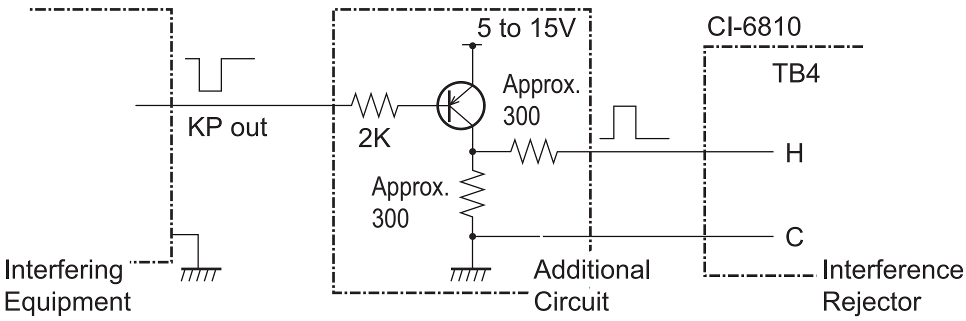


If the level is out of the ratings or KP output circuit is not provided, take the measures shown on the next two pages to prevent equipment malfunction.

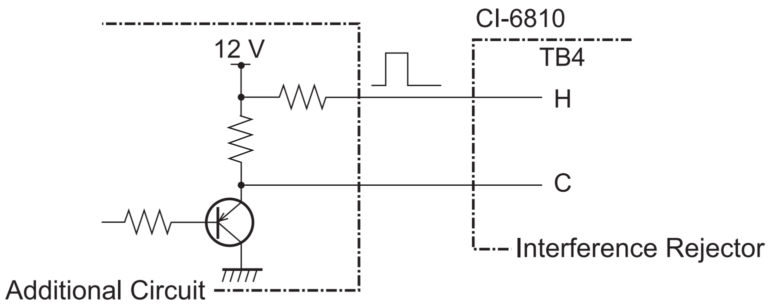
Buffer circuit for positive-going KP



Buffer circuit for negative-going KP



The following method also is available.



Buffer circuit for keying pulse (KP)

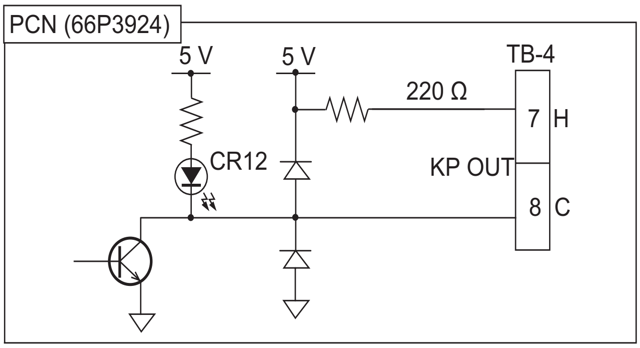
DIP switch settings

When KP signal is input to KP IN1, set the switch S1-#3 on the PCN Board 66P3924 to ON. KP signal is positive logic: Set the switch S1-#1 on the PCN Board to OFF. KP signal is negative logic: Set the switch S1-#1 on the PCN Board to ON

When KP signal is input to KP IN2, set the switch S1-#4 on the PCN Board 66P3924. KP signal is positive logic: Set the switch S1-#2 on the PCN Board to OFF. KP signal is negative logic: Set the switch S1-#2 on the PCN Board to ON

Output

When outputting keying pulse to suppress interference to other ultrasound equipment, take the TX trigger pulse from TB4 (KP OUT), which is the KP terminal for external output.



4.4 Setting Output Data

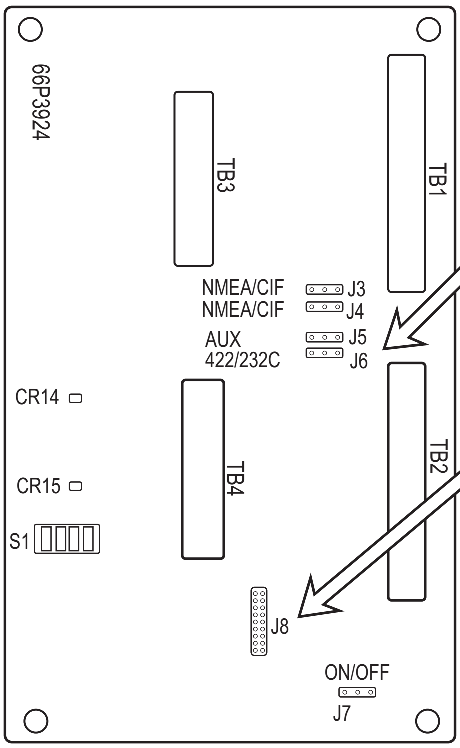
You can select data output from TB2-#1 and #2 on the terminal board by the setting on the PCN Board 66P3924.

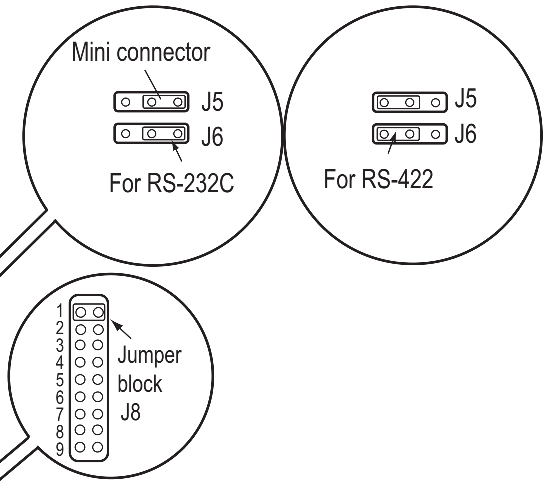
Type

Select RS-422 (default setting) or RS-232C by setting the DIP switch J5 and J6 on the PCN Board 66P3924.

Data

Select the output data among NMEA, CIF, Current data and Display data. Use the jumper block J8 on the PCN Board 66P3924.





	Inscription on PCB	Output data
1	(N_TXD)	Row data (N value)
2	CID_DL_TXD	Current data (TX)
3	NMEA1_TXD	NMEA1 (TX)
4	NMEA2_TXD	NMEA2(TX): Switchable with CIF on menu
5	DISP_TXD	Display data
6	(CID_DL_RXD)	Current data (RX)
7	(NMEA1_RXD)	NMEA1 (RX)
8	(NMEA2_RXD)	NMEA2(RX): Switchable with CIF on menu
9	(DISP_RXD)	Current data

4.5 DIP Switch Setting

4.5.1 Tide calculation response

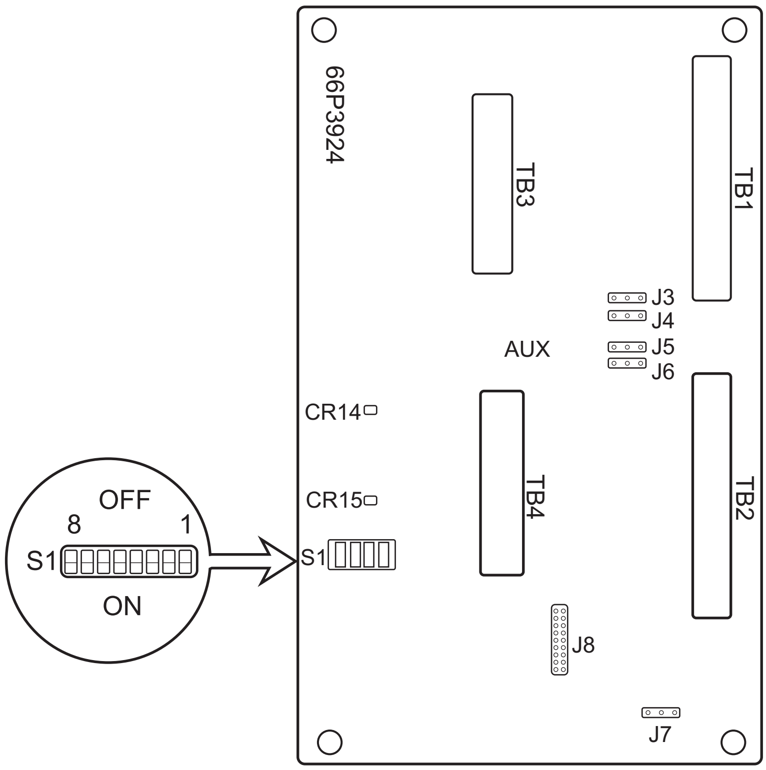
If the tide calculation response is too slow, set the DIP switch S1 on the PON Board 66P3924 appropriately.

DIP #	Function	Default Setting	OFF	ON
5	Minute constant selection (current response time for NAV mode)	OFF	Normal (Normal setting. Minute constant: 0.05 kn)	Slow (When current speed is slow and unstable. Minute constant: 0.1 kn)
6	Smoothing filter	OFF	YES	NO
7	Bearing addition	OFF	Adds bearing information before averaging the ship's speed.	Adds bearing information after averaging the ship's speed.

4.5.2 Speed output interval

Select the output interval of ship's speed display.

DIP #	Function	Default Setting	OFF	ON
8	Select output interval of ship's speed.	OFF	3 sec	1 sec



PON Board 66P3924

4.6 Sea Trial Check

4.6.1 Ship's speed test

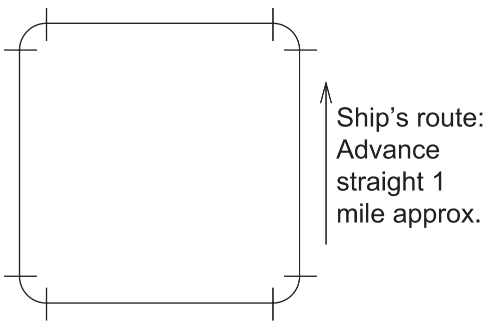
Do the milepost test where ground tracking measurement can be done.

1. Reset the distance run at the moment the milepost test is initiated.
2. Read the distance run at the moment the milepost test is initiated.
3. Calculate true ship's speed (1) from the data of the milepost test and ship's speed of the CI-68 from that of the distance run (2).
4. If the error between (1) and (2) is more than ± (1%+0.1 kn), correct it referring to the [GT SPD CALIB] on page 4-3. Calibrating is not necessary when the error is within ± (1%+0.1 kn).
5. Repeat the milepost test several times. Record the data in Table 1.
6. Record the ship's speed every 10 seconds in table 2.
7. Calculate the average ship's speed from the data in the Table 2 to compute accuracy.

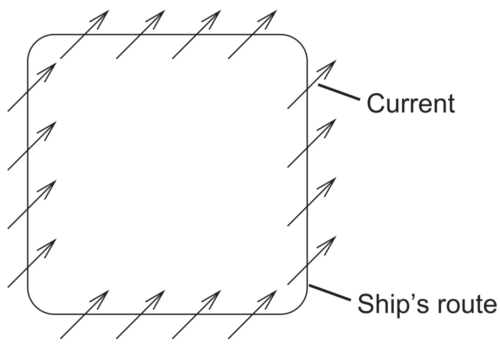
4.6.2 Current data check

Use the ground tracking mode to record the current (tide) data.

1. Run your boat following the square course shown below. Each side of the square is about 1 mile in length.
2. Record the ship's speed and tide data every 30 seconds in table 3.



3. On a separate piece of paper, plot the current speed and direction based on the table 3. Confirm that the current reading is stable in any ship's heading. (Only when the current changes minimally while the ship runs square course.)



Confirm that the currents orient the same direction. If not, the interference from other equipment, air bubbles and noise may be present. Also, take into account that interference from air bubbles may occur since there is no load in the milepost test.

Note: When a bearing sensor is connected in lieu of a gyrocompass, accurate measurement of current direction is not expected because the bearing data itself is in error. Note that it is difficult to distinguish this unit reading when the above test is done where the current is complex.

Table 1: Ship's Speed Test

TEST SITE ____________________ CAPTAIN ____________________ DRAFT Fore ______ Aft ______ Mean ______ (m)

SHIP'S NAME ____________________ SHIP NUMBER ____________________ SHIP YARD ____________________ SHIP'S LENGTH ______________ (m)

DATE	TIME	ENGINE		MILEPOST*1		Current Indicator				EM-LOG (kn)	DEPTH (m)	COURSE (Deg)	WIND (m/s)	SEA COND.	CURRENT (kn)	Remarks
		OUTPUT	RPM	(kn)	TIME (s)	SPEED (kn)	DIST *3 (kn)	TIME (s)	ERR. (%)*2							
AVG.																
AVG.																
AVG.																
AVG.																Measuring Mode GROUND WATER
AVG.																

*1 : Milepost ______________ miles

*2 : Error $= \dfrac{\text{Speed ,easured by milepost - Current Indicator Speed}}{\text{Speed measured by milepost}} \times 100\ (\%)$

*3 : Current Indicator Speed $= \dfrac{\text{Mile (Milepost)}}{\text{Time (sec)}} \times 3600$

Table 2: Ship's Speed Test

TIME	SPD (kn)	Remarks	TIME	SPD (kn)	Remarks
00			00		
10		SHIP NUMBER______	10		SHIP NUMBER______
20		DEPTH______(m)	20		DEPTH______(m)
30		TEST SITE______	30		TEST SITE______
40		WIND SPEED	40		WIND SPEED
50			50		
00		△	00		△
10		COURSE______(ms)	10		COURSE______(ms)
20			20		
30			30		
40			40		
50			50		
00			00		
10			10		
20			20		
30			30		
40			40		
50			50		
00			00		
10			10		
20			20		
30			30		
40			40		
50			50		
00			00		
10			10		
20			20		
30			30		
10			40		
50			50		
00			00		

Table 3: Current Display Behaviour Test

SHIP'S NAME ________ SHIP'S TYPE ________ Load ________ TEST DATE ________ TEST SITE ________

No.	TIME	SHIP'S HDG. (DEG.)	SHIP'S SPD		LAYER 1			LAYER 2			LAYER 3			LAYER 4			LAYER 5			WIND (REL)		Remarks
			FORE/AFT (kn)	LEFT/RIGHT (kn)	SPD (kn)	DIR	DEPTH (m)	SPD (kn)	DIR	DEPTH (m)	SPD (kn)	DIR	DEPTH (m)	SPD (kn)	DIR	DEPTH (m)	SPD (kn)	DIR	DEPTH (m)	SPD (m/s)	DIR (DEG.)	
1																						
2																						
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						
1																						
2																						
3																						
4																						
5																						
6																						
7																						
8																						

Measuring mode GROUND / WATER

Depth LAYER 1 ________ (m)

LAYER 2 ________ (m)

LAYER 3 ________ (m)

SIGN ________

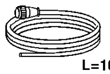
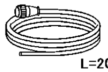
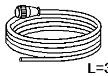
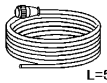
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FURUNO

CODE NO.		66AS-X-9405 -0
TYPE		1/1

工事材料表
INSTALLATION MATERIALS

CI-68/88

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS		数量 Q'TY	用途／備考 REMARKS
1	ｹｰﾌﾞﾙ組品 CABLE ASSY.	 L=10M	66S1238 *10M*		1	選択 TO BE SELECTED 操作部－送受信演算部用 FOR CONTROL UNIT-TRANSCEIVER UNIT
			CODE NO.	000-148-486		
2	ｹｰﾌﾞﾙ組品 CABLE ASSY.	 L=20M	66S1238 *20M*		1	選択 TO BE SELECTED 操作部－送受信演算部用 FOR CONTROL UNIT-TRANSCEIVER UNIT
			CODE NO.	000-148-487		
3	ｹｰﾌﾞﾙ組品 CABLE ASSY.	 L=30M	66S1238 *30M*		1	選択 TO BE SELECTED 操作部－送受信演算部用 FOR CONTROL UNIT-TRANSCEIVER UNIT
			CODE NO.	000-148-490		
4	ｹｰﾌﾞﾙ組品 CABLE ASSY.	 L=50M	66S1238 *50M*		1	選択 TO BE SELECTED 操作部－送受信演算部用 FOR CONTROL UNIT-TRANSCEIVER UNIT
			CODE NO.	000-148-491		

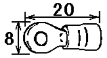
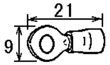
66AS-X-9405

FURUNO ELECTRIC CO ., LTD.
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO

CODE NO.	006-917-660-00	66AS-X-9401 -2
TYPE	CP66-01501	1/1

工事材料表
INSTALLATION MATERIALS

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS		数量 Q'TY	用途／備考 REMARKS
1	圧着端子 CRIMP-ON LUG	 20 / 8	FV1.25-4(LF)		10	
			FV1.25-4			
			CODE NO.	000-166-666-10		
				000-538-114-00		
2	圧着端子 CRIMP-ON LUG	 21 / 9	FV2-4		5	
			FV2-4 ｱｵ			
			CODE NO.	000-157-247-10		
				000-538-118-00		

型式/ｺｰﾄﾞ番号が２段の場合、下段より上段に代わる過渡期品であり、どちらかが入っています。 なお、品質は変わりません。
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO ELECTRIC CO ., LTD.

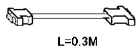
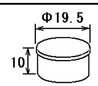
66AS-X-9401

FURUNO

CODE NO.	006-916-750	66AS-X-9402 -2
TYPE	CP66-01503	1/1

工事材料表

INSTALLATION MATERIALS

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	ｹｰﾌﾞﾙ組品 CABLE ASSY.		66S1239-0 *0.3M* CODE NO. 000-148-492	1	
2	ﾎﾞｳｽｲｷｬｯﾌﾟ WATERPROOFING CAP		MJ-A10C CODE NO. 000-154-639	1	

66AS-X-9402

FURUNO ELECTRIC CO ., LTD.

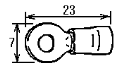
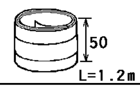
（略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

FURUNO

CODE NO.	006-917-350-00	66AS-X-9404 -3
TYPE	CP66-01504	1/1

工事材料表

INSTALLATION MATERIALS

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	圧着端子 CRIMP-ON LUG		FV5.5-S4(LF) FV5.5-S4 CODE NO. 000-166-750-10 000-538-121-00	4	
2	ｱｰｽ板 COPPER STRAP		WEA-1004-0 ROHS WEA-1004-0 CODE NO. 500-310-040-10 500-310-040-00	1	

型式/ｺｰﾄﾞ番号が２段の場合、下段より上段に代わる過渡期品であり、どちらかが入っています。 なお、品質は変わりません。

TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.

（略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

FURUNO ELECTRIC CO ., LTD.

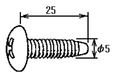
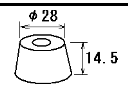
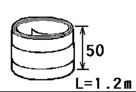
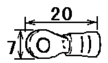
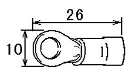
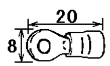
66AS-X-9404

FURUNO

CODE NO.	006-927-330-00	66AL-X-9405 -6
TYPE	CP66-00703	1/1

工事材料表

INSTALLATION MATERIALS

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	+ﾄﾗｽﾀｯﾋﾟﾝﾈｼﾞ 1ｼｭ SELF-TAPPING SCREW		5X25 SUS304 CODE NO. 000-162-610-10	4	
2	ｺﾞﾑｽﾘｰﾌﾞ RUBBER SLEEVE		66-030-5001-0 CODE NO. 100-314-490-00	1	
3	ｱｰｽ板 COPPER STRAP		WEA-1004-0 ROHS WEA-1004-0 CODE NO. 500-310-040-10 500-310-040-00	1	
4	圧着端子 CRIMP-ON LUG		FV2-P4 CODE NO. 000-157-232-10	10	ｼｰﾙﾄﾞ線用 FOR SHIELD
5	圧着端子 CRIMP-ON LUG		FV5.5-5 (LF) CODE NO. 000-166-745-10	3	一括ｼｰﾙﾄﾞ､鎧窓ｱｰｽ用 FOR GROUND OF SHIELD AND ARMOR
6	圧着端子 CRIMP-ON LUG		FV1.25-4(LF) FV1.25-4 CODE NO. 000-166-666-10 000-538-114-00	18	芯線用 FOR CORES

型式/ｺｰﾄﾞ番号が２段の場合、下段より上段に代わる過渡期品であり、どちらかが入っています。　なお、品質は変わりません。

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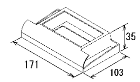
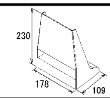
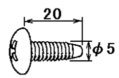
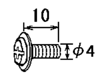
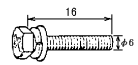
（略図の寸法は、参考値です。　DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

FURUNO

CODE NO.	001-413-590-00	02FJ-X-9508 -3
TYPE	FP02-05101	1/1

付属品表

ACCESSORIES

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	ﾄﾘﾂｹﾀﾞｲ MOUNTING BASE		02-127-1301-1 ROHS 02-127-1301-1 CODE NO. 100-285-141-10 100-285-141-00	1	
2	ﾊﾝｶﾞｰ BRACKET		02-127-1302-1 ROHS 02-127-1302-1 CODE NO. 100-285-151-10 100-285-151-00	1	
3	+ﾄﾗｽﾀｯﾋﾟﾝﾈｼﾞ 1ｼｭ SELF-TAPPING SCREW		5X20 SUS304 CODE NO. 000-162-608-10	4	
4	+ﾊﾞｲﾝﾄﾞｾﾑｽF WASHER BINDING HEAD SCREW		M4X10 C2700W MBCR2 ﾋﾗ CODE NO. 000-163-543-10	4	
5	+ｱﾌﾟｾｯﾄUIｾﾑｽB +HEX.BOLT		M6X16 SUS304 CODE NO. 000-163-758-10	2	

型式/ｺｰﾄﾞ番号が２段の場合、下段より上段に代わる過渡期品であり、どちらかが入っています。　なお、品質は変わりません。

TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.

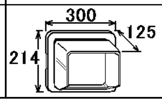
（略図の寸法は、参考値です。　DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

FURUNO

CODE NO.	006-556-240	06AS-X-9503 -3
TYPE	FP06-01102	1/1

付属品表

ACCESSORIES

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	ﾌｰﾄﾞ ｸﾐﾋﾝ HOOD ASSY.		FP06-01102 CODE NO. 006-556-240	1	

06AS-X-9503

FURUNO ELECTRIC CO ., LTD.

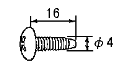
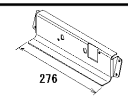
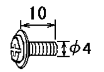
(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO

CODE NO.	006-916-680-00	66AS-X-9501 -2
TYPE	FP66-00601	1/1

付属品表

ACCESSORIES

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	+ﾄﾗｽﾀｯﾋﾟﾝｸﾞﾈｼﾞ 1ｼｭ SELF-TAPPING SCREW		4X16 SUS304 CODE NO. 000-162-605-10	4	
2	ﾌﾞﾗｹｯﾄ BRACKET		66-030-3021-0 ROHS 66-030-3021-0 CODE NO. 100-307-800-10 100-307-800-00	1	
3	+ﾊﾞｲﾝﾄﾞｾﾑｽF WASHER BINDING HEAD SCREW		M4X10 C2700W MBCR2 ﾋﾗ CODE NO. 000-163-543-10	2	

型式/ｺｰﾄﾞ番号が２段の場合、下段より上段に代わる過渡期品であり、どちらかが入っています。 なお、品質は変わりません。

TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO ELECTRIC CO ., LTD.

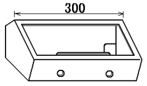
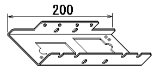
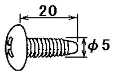
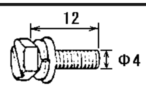
66AS-X-9501

FURUNO

CODE NO.	006-556-260-00	06AS-X-9501 -7
TYPE	FP06-01120	1/1

付属品表

ACCESSORIES

番号 NO.	名称 NAME	略図 OUTLINE	型名／規格 DESCRIPTIONS	数量 Q'TY	用途／備考 REMARKS
1	操作取付台 ONTROL UNIT MOUNTING BASE		06-021-2111-1 CODE NO. 100-279-741-10	1	
2	ｿｳｻﾌﾞﾗｹｯﾄ CONTROL UNIT BRACKET		06-021-2112-0 ROHS CODE NO. 100-281-880-10	1	
3	+ﾄﾗｽﾀｯﾋﾟﾝﾈｼﾞ 1ｼｭ SELF-TAPPING SCREW		5X20 SUS304 CODE NO. 000-162-608-10	2	
4	ﾎｰﾙﾌﾟﾗｸﾞ COSMETIC PLUG		DP-687 ｸﾛ CODE NO. 000-165-997-10	2	
5	六角ｽﾘﾜﾘ ｾﾑｽB HEX.BOLT (SLOTTED,WASHER HEAD)		M4X12 SUS304 CODE NO. 000-162-939-10	4	

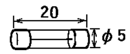
型式/ｺｰﾄﾞ番号が２段の場合、下段より上段に代わる過渡期品であり、どちらかが入っています。　なお、品質は変わりません。
TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM.　THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.
（略図の寸法は、参考値です。　DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

FURUNO ELECTRIC CO ., LTD.　　06AS-X-9501

FURUNO

CODE NO.	006-916-730	66AS-X-9301 -1 1/1
TYPE	SP66-00801	BOX NO. P

SHIP NO.	SPARE PARTS LIST FOR	U S E	SETS PER VESSEL

ITEM NO.	NAME OF PART	OUTLINE	DWG. NO. OR TYPE NO.	QUANTITY WORKING PER SET	QUANTITY WORKING PER VES	QUANTITY SPARE	REMARKS/CODE NO.
1	ﾋｭｰｽﾞ FUSE		FGMB 125V 2A PBF			3	操作部 CONTROL UNIT 000-157-479

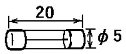
MFR'S NAME	FURUNO ELECTRIC CO.,LTD.	DWG NO.	66AS-X-9301	1/1

（略図の寸法は、参考値です。　DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

FURUNO

CODE NO.	006-556-200	06AS-X-9301 -4 1/1
TYPE	SP06-01101	BOX NO. P

SHIP NO.	SPARE PARTS LIST FOR	U S E	SETS PER VESSEL

ITEM NO.	NAME OF PART	OUTLINE	DWG. NO. OR TYPE NO.	QUANTITY WORKING PER SET	PER VES	SPARE	REMARKS/CODE NO.
1	ヒューズ FUSE		FGMB 125V 3A PBF	1		3	000-157-481

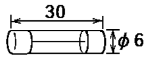
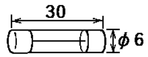
MFR'S NAME	FURUNO ELECTRIC CO.,LTD.	DWG NO.	06AS-X-9301	1/1

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

FURUNO

CODE NO.	006-917-330	66AS-X-9302 -1 1/1
TYPE	SP66-00802	BOX NO. P

SHIP NO.	SPARE PARTS LIST FOR	U S E	SETS PER VESSEL

ITEM NO.	NAME OF PART	OUTLINE	DWG. NO. OR TYPE NO.	QUANTITY WORKING PER SET	PER VES	SPARE	REMARKS/CODE NO.
1	ヒューズ FUSE		FGBO 250V 3A PBF FGBO 3A AC250V			3	000-155-841-10 000-549-021-00
2	ヒューズ FUSE		FGBO 250V 5A PBF FGBO 5A AC250V			4	000-155-840-10 000-549-022-00

MFR'S NAME	FURUNO ELECTRIC CO.,LTD.	DWG NO.	66AS-X-9302	1/1

(略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.)

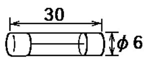
型式/コード番号が２段の場合、下段より上段に代わる過渡期品でどあり、ちらかが入っています。 なお、品質は変わりません。

TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.

FURUNO

CODE NO.	006-917-340	66AS-X-9303 -1 1/1
TYPE	SP66-00803	BOX NO. P

SHIP NO.	SPARE PARTS LIST FOR	U S E	SETS PER VESSEL

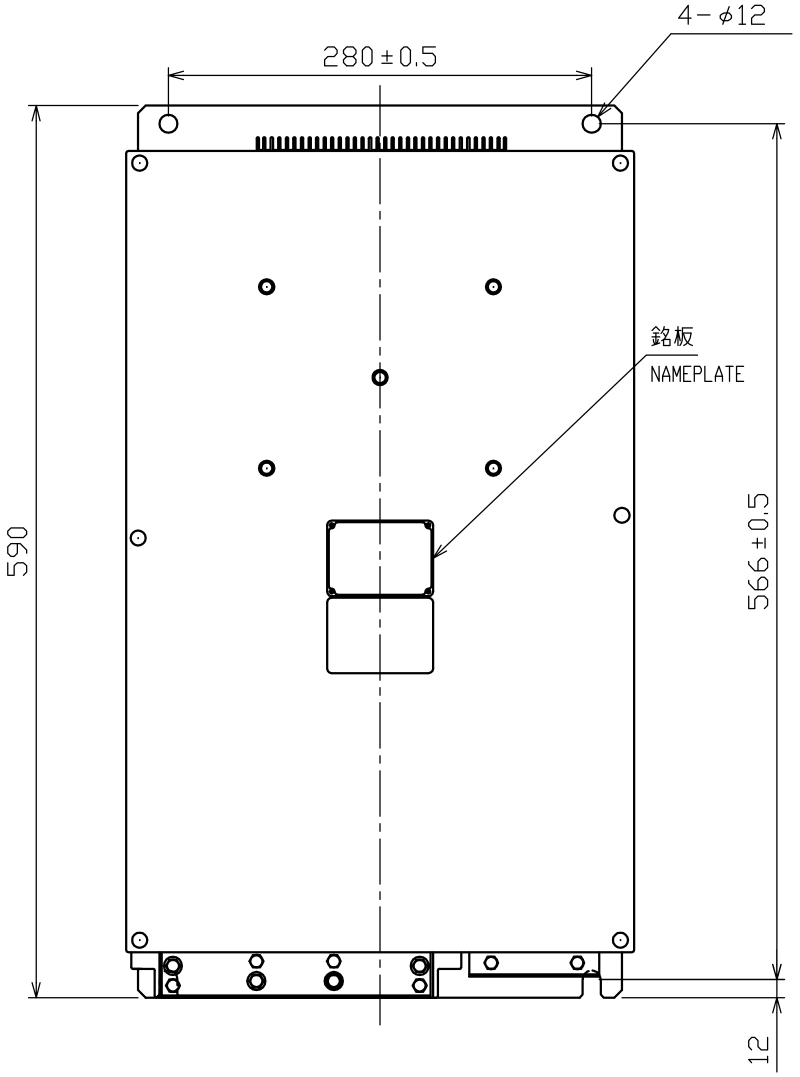
ITEM NO.	NAME OF PART	OUTLINE	DWG. NO. OR TYPE NO.	QUANTITY WORKING PER SET	QUANTITY WORKING PER VES	SPARE	REMARKS/CODE NO.
1	ﾋｭｰｽﾞ FUSE		FGBO 250V 3A PBF FGBO 3A AC250V			7	000-155-841-10 000-549-021-00

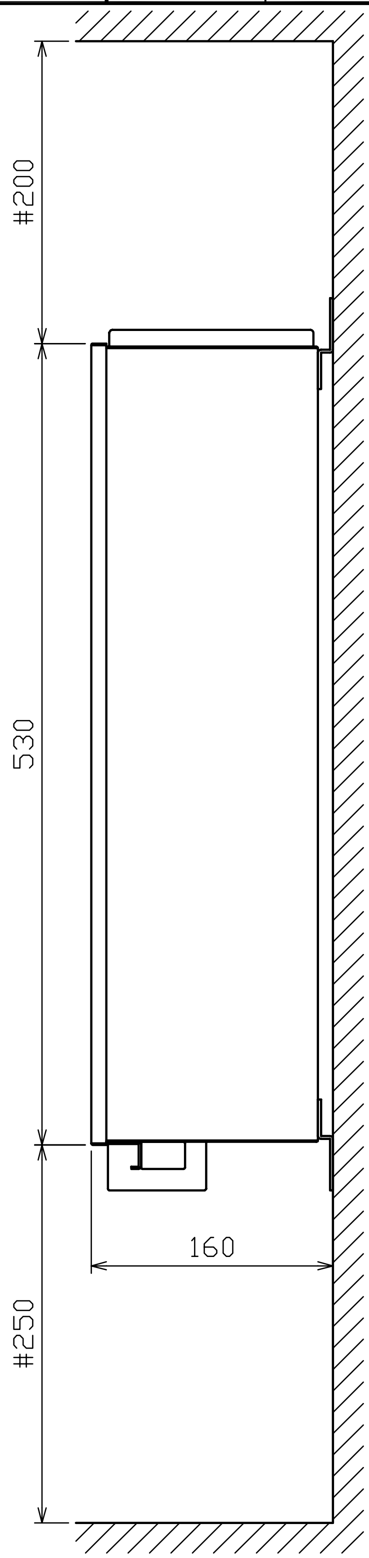
MFR'S NAME	FURUNO ELECTRIC CO.,LTD.	DWG NO.	66AS-X-9303	1/1

（略図の寸法は、参考値です。 DIMENSIONS IN DRAWING FOR REFERENCE ONLY.）

型式/ｺｰﾄﾞ番号が２段の場合、下段より上段に代わる過渡期品であり、どちらかが入っています。 なお、品質は変わりません。

TWO TYPES AND CODES MAY BE LISTED FOR AN ITEM. THE LOWER PRODUCT MAY BE SHIPPED IN PLACE OF THE UPPER PRODUCT. QUALITY IS THE SAME.





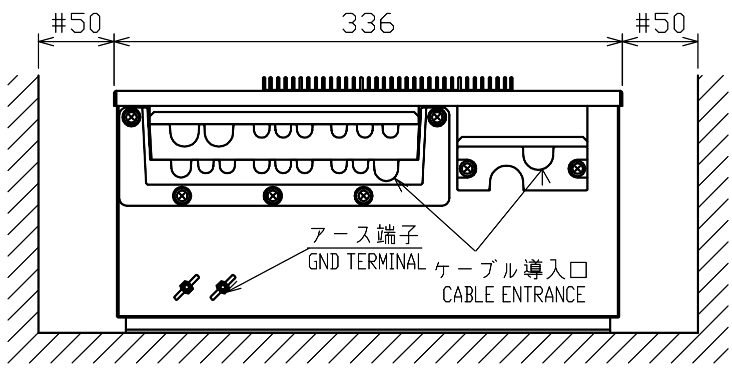


表1 TABLE 1

寸法区分（ｍｍ） DIMENSIONS	公差（ｍｍ） TOLERANCE
Ｌ≦５０	±１．５
５０＜Ｌ≦１００	±２．５
１００＜Ｌ≦５００	±３
５００＜Ｌ≦１０００	±４

注　記　１）　＃印寸法は最小サービス空間寸法とする。
２）　指定外の寸法公差は表１による。
３）　取付用ネジはＭ10ボルトを使用のこと。

NOTE
1. #: MINIMUM SERVICE CLEARANCE.
2. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
3. USE M10 BOLTS FOR FIXING THE UNIT.

DRAWN	Oct. 22 '03 E. MIYOSHI		TITLE	CI-6810
CHECKED	Takahashi T.		名称	送受信演算部
APPROVED	Y. Hatai	CI-68		外寸図
SCALE 1/5	MASS 19 kg ±10%		NAME	TRANSCEIVER UNIT
DWG.No.	C7252-G03-A	66-030-100G-3		OUTLINE DRAWING

FURUNO

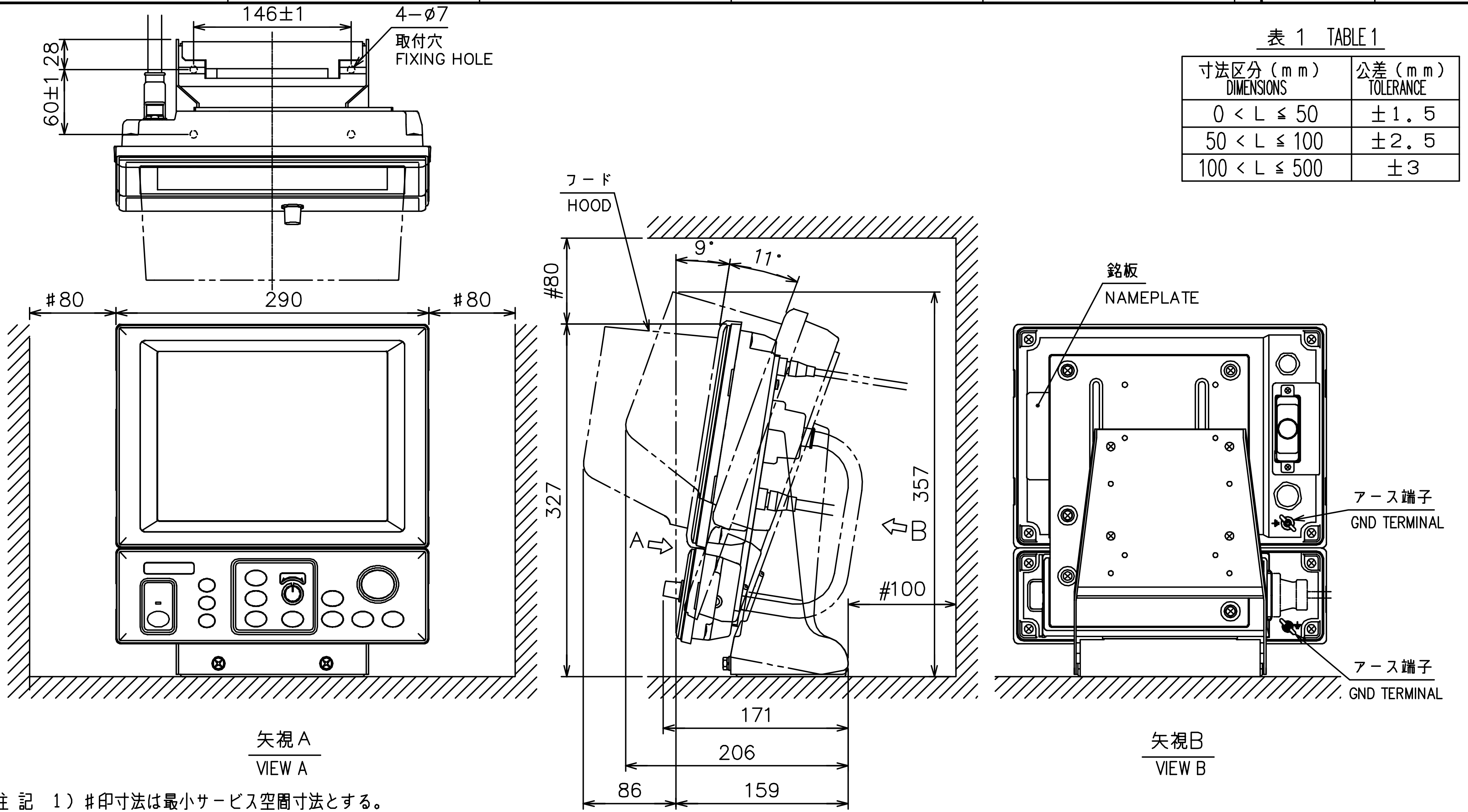


表１　TABLE 1

寸法区分（ｍｍ） DIMENSIONS	公差（ｍｍ） TOLERANCE
0 ＜ L ≦ 50	±１．５
50 ＜ L ≦ 100	±２．５
100 ＜ L ≦ 500	±３

注 記
1）#印寸法は最小サービス空間寸法とする。
2）指定外の寸法公差は表１による。
3）取付用ネジは＋トラスタッピンネジ呼び径5x20を使用のこと。
4）装備ケーブルはサービス時、本体を前方に十分引出せるよう余裕を持たせること。

NOTE
1. #: MINIMUM SERVICE CLEARANCE.
2. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
3. USE TAPPING SCREWS 5x20 FOR FIXING UNIT.
4. KEEP ENOUGH CABLE LENGTH BEHIND UNIT.

DRAWN	JULY 22, '04 E. MIYOSHI	TITLE	MU-100C + CI-6888
CHECKED	TAKAHASHI. T	名称	表示部＋操作部
APPROVED	Y. Hatai / CI-68/88		外寸図
SCALE	1/5 MASS 6.0 ±10% kg	NAME	MONITOR UNIT AND CONTROL UNIT
DWG.No.	C7252-G01-B / 66-030-300G-1		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO

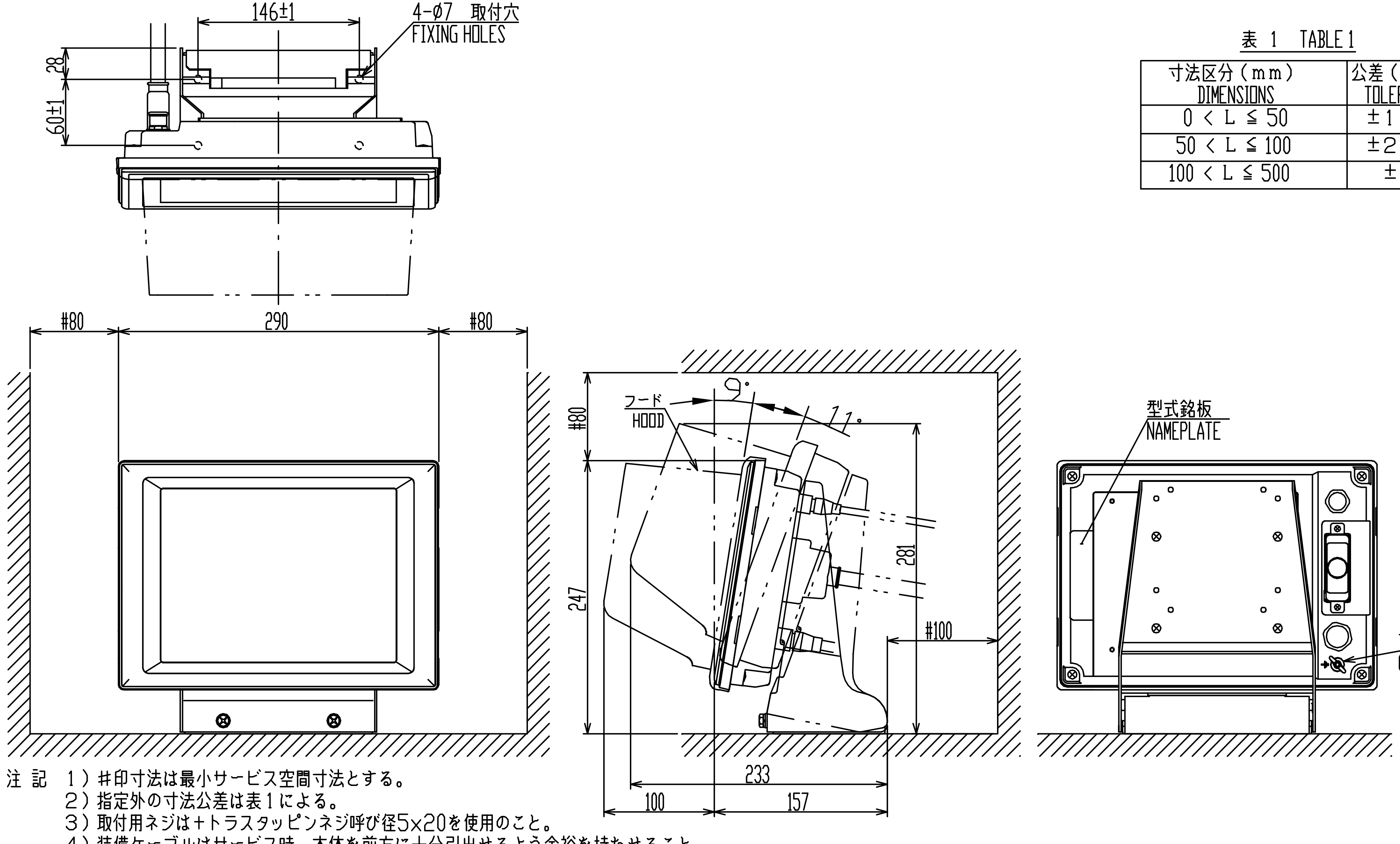


表 1 TABLE 1

寸法区分（mm） DIMENSIONS	公差（mm） TOLERANCE
0 ＜ L ≦ 50	±1．5
50 ＜ L ≦ 100	±2．5
100 ＜ L ≦ 500	±3

注 記

1）♯印寸法は最小サービス空間寸法とする。
2）指定外の寸法公差は表1による。
3）取付用ネジは+トラスタッピンネジ呼び径5×20を使用のこと。
4）装備ケーブルはサービス時、本体を前方に十分引出せるよう余裕を持たせること。

NOTE

1. #: MINIMUM SERVICE CLEARANCE.
2. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
3. USE SELF-TAPPING SCREWS 5x20 FOR FIXING THE UNIT.
4. LEAVE ENOUGH SLACK IN CABLING SO UNIT CAN BE DRAWN FORWARD WITHOUT DISCONNECTING CABLING.

DRAWN	Dec. 15, '04 E.MIYOSHI	TITLE	MU-100C
CHECKED	TAKAHASHI. T CH-300	名称	表示部（分離型、卓上装備）
APPROVED	Y. Hatai CH-250/S		外寸図
SCALE	1/5 MASS $4.2^{+10\%}_{-}$ kg	NAME	MONITOR UNIT (SEPARATE, TABLETOP MOUNT)
DWG.No.	C1316-G08- D 06-021-191G- 2		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

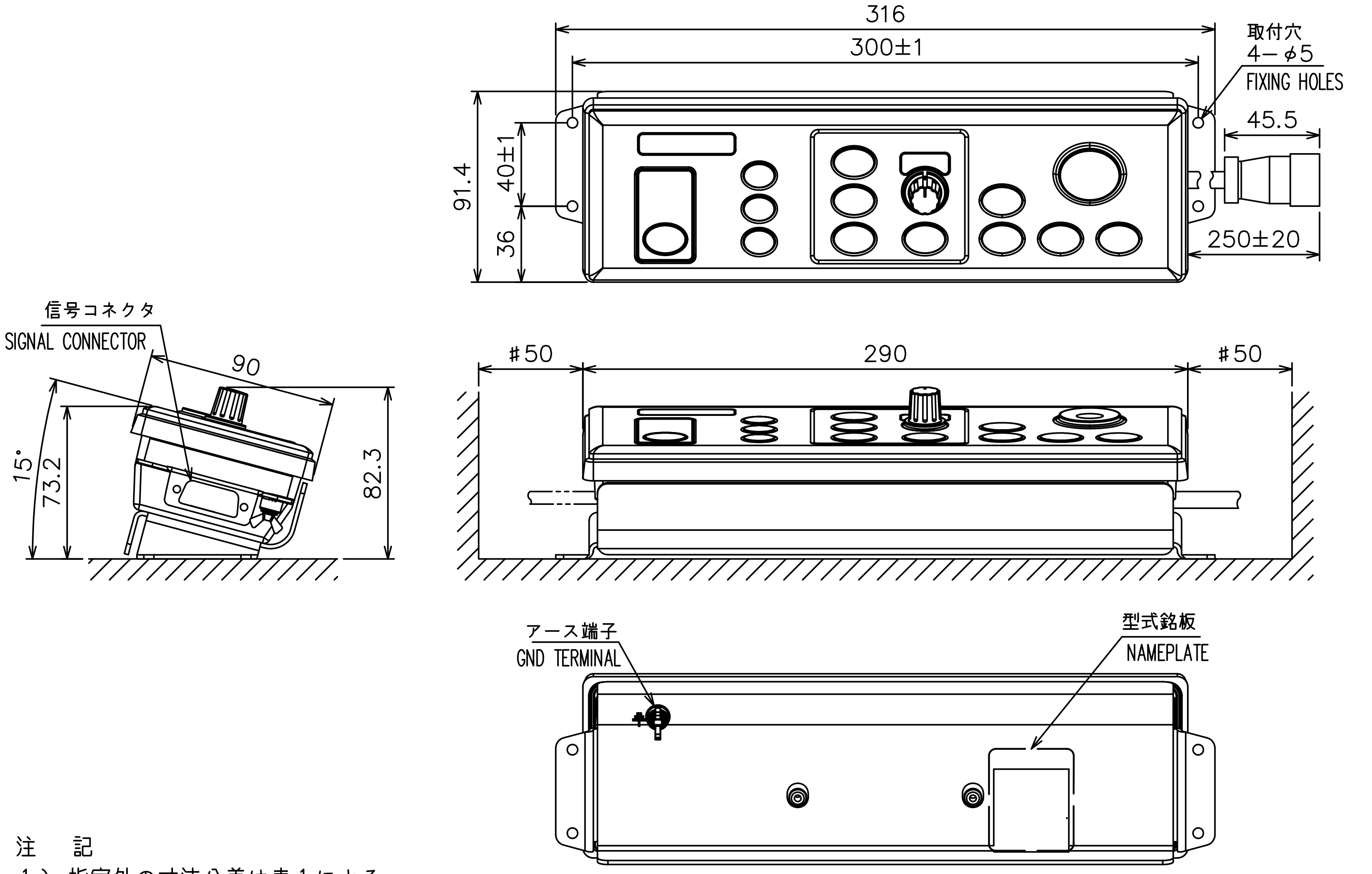


表1 TABLE 1

寸法区分(mm) DIMENSION	公差(mm) TOLERANCE
0 < L ≦ 50	±1.5
50 < L ≦ 100	±2.5
100 < L ≦ 500	±3

注 記

1） 指定外の寸法公差は表１による。
2） #印寸法は最小サービス空間寸法とする。
3） 取付ネジは＋トラスタッピンネジ呼び径４ｘ１６を使用のこと。

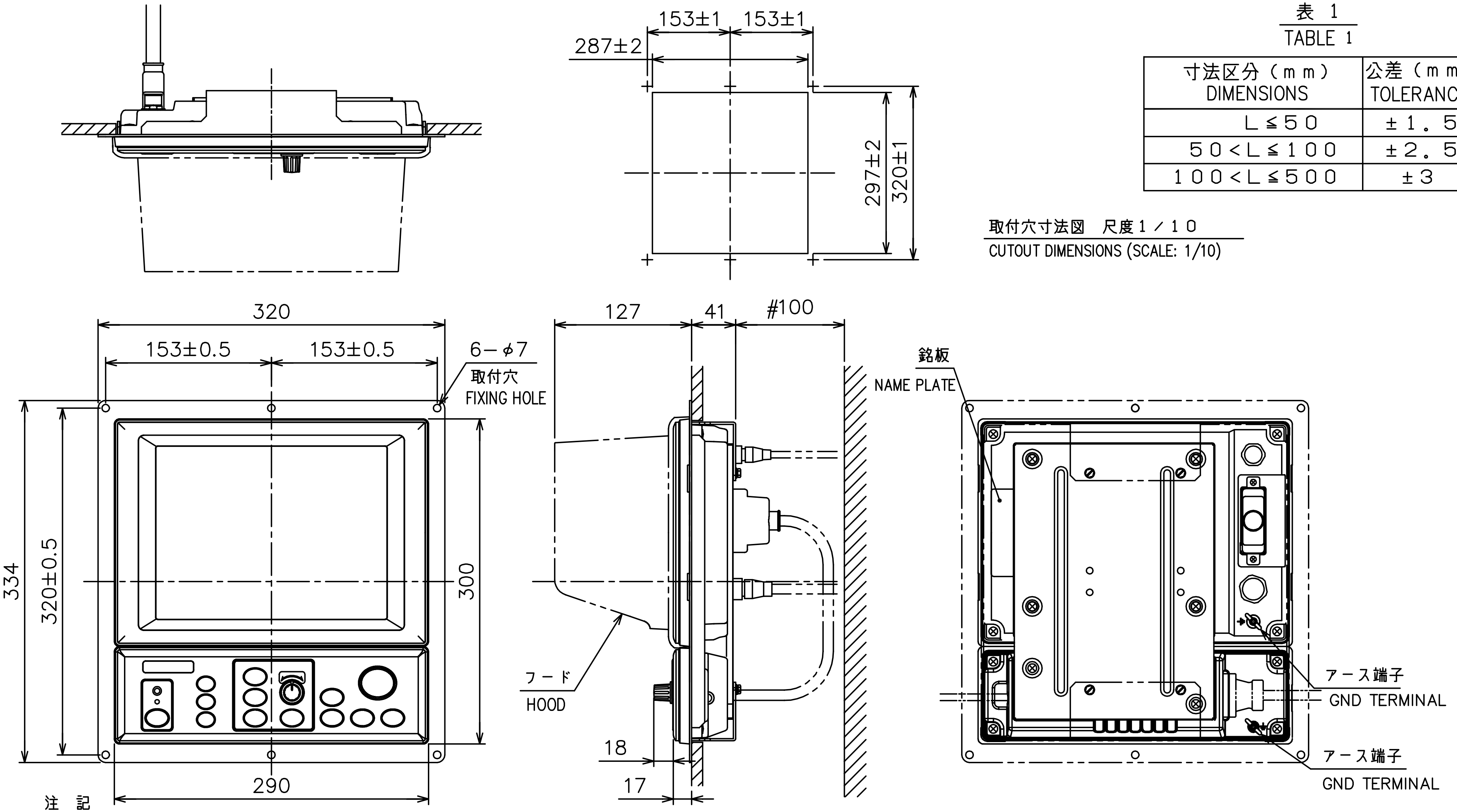
NOTE

1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
2. #: MINIMUM SERVICE CLEARANCE.
3. USE TAPPING SCREWS ø4x16 FOR FIXING THE UNIT.

DRAWN 22/Mar/2011 T.YAMASAKI		TITLE	CI-6888
CHECKED 22/Mar/2011 H.MAKI		名称	操作部（卓上装備）
APPROVED 22/Mar/2011 Y.NISHIYAMA	CI-68/88		外寸図
SCALE 1/3 MASS 1.9 ±10% kg		NAME	CONTROL UNIT (TABLETOP MOUNT)
DWG.No. C7252-G02- B	REF.No. 66-030-310G-2		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO



取付穴寸法図　尺度１／１０
CUTOUT DIMENSIONS (SCALE: 1/10)

表 1
TABLE 1

寸法区分（ｍｍ） DIMENSIONS	公差（ｍｍ） TOLERANCE
Ｌ≦５０	±１．５
５０＜Ｌ≦１００	±２．５
１００＜Ｌ≦５００	±３

注 記

１） ＃印寸法は最小サービス空間寸法とする。
２） 指定外の寸法公差は表１による。
３） 取付用ネジは＋トラスタッピングネジ呼び径５ｘ２０を使用のこと
４） 装備ケーブルはサービス時、本体を前方に十分引き出せるよう余裕を持たせること。

NOTE
1. #: MINIMUM SERVICE CLEARANCE.
2. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
3. USE TAPPING SCREWS 5x20 FOR FIXING UNIT.
4. KEEP ENOUGH CABLE LENGTH BEHIND UNIT.

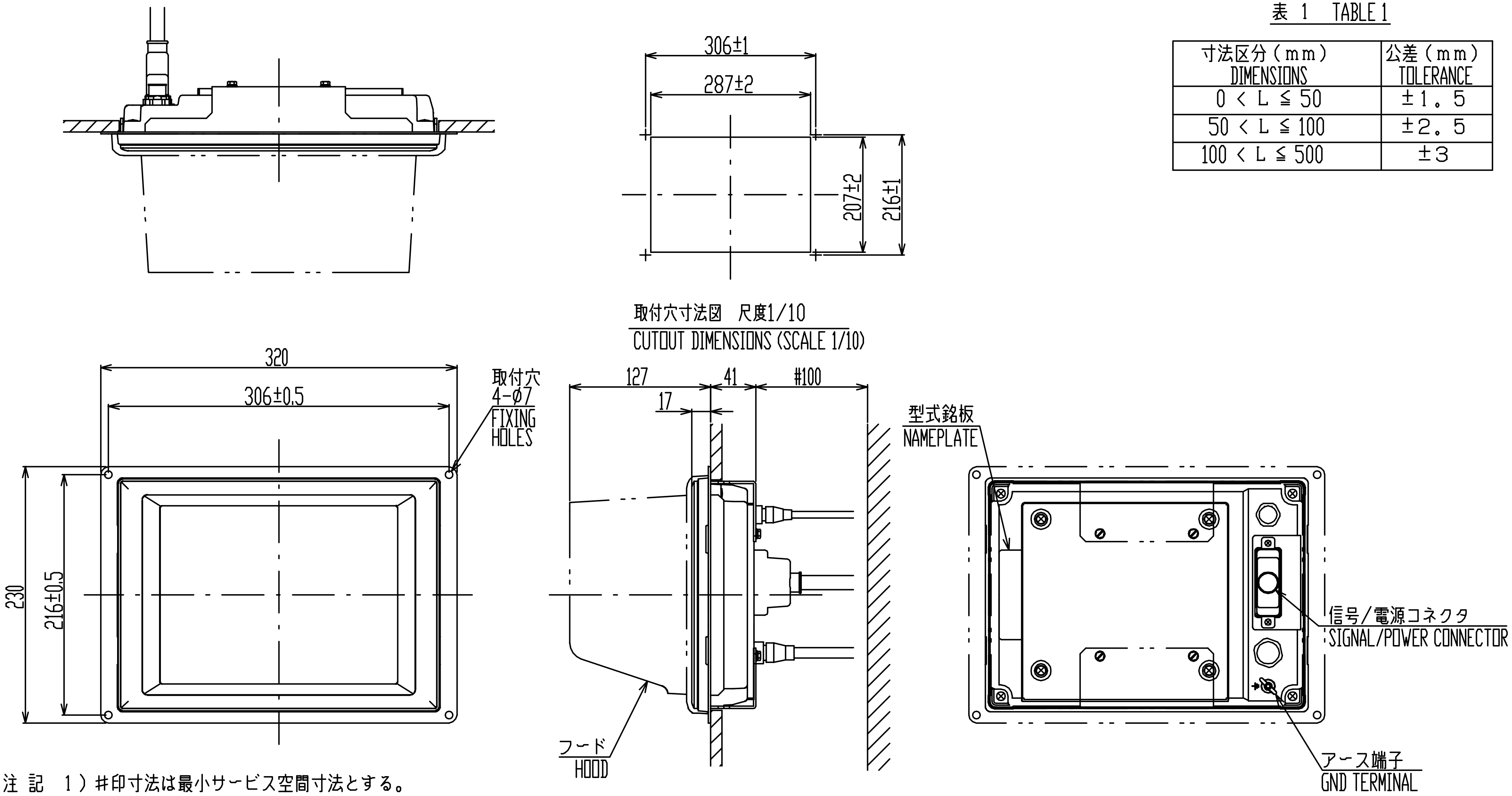
DRAWN Oct. 22 '03 E. MIYOSHI		TITLE	MU-100C+CI-6888
CHECKED Takahashi T.		名称	表示部＋操作部（埋込装備）
APPROVED Y. Hatai	CI-68/88		外寸図
SCALE 1/5 MASS 6.0 ±10% kg		NAME	MONITOR UNIT AND CONTROL UNIT (FLUSH MOUNT)
DWG No. C7252-G04- B	66-030-320G- 1		OUTLINE DRAWING

FURUNO ELECTRIC CO., LTD.

FURUNO

表 1 TABLE 1

寸法区分（mm） DIMENSIONS	公差（mm） TOLERANCE
0 ＜ L ≦ 50	±1．5
50 ＜ L ≦ 100	±2．5
100 ＜ L ≦ 500	±3



注 記 1）#印寸法は最小サービス空間寸法とする。
2）指定外の寸法公差は表1による。
3）取付用ネジは+トラスタッピンネジ呼び径5x20を使用のこと。
4）装備ケーブルはサービス時、本体を前方に十分引出せるよう余裕を持たせること。

NOTE 1. #: MINIMUM SERVICE CLEARANCE.
2. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
3. USE SELF-TAPPING SCREWS 5x20 FOR FIXING THE UNIT.
4. LEAVE ENOUGH SLACK IN CABLING SO UNIT CAN BE DRAWN FORWARD WITHOUT DISCONNECTING CABLING.

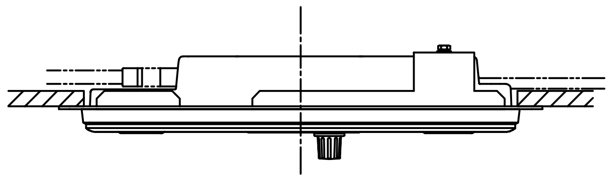
DRAWN	Apr. 12, '05 E.MIYOSHI		TITLE MU-100C
CHECKED	TAKAHASHI. T	CH-300	名称 表示部（分離型、埋込装備）
APPROVED	Y. Hatai	CH-250/S	外寸図
SCALE 1/5	MASS 3.0 $^{+10\%}$ kg		NAME MONITOR UNIT (SEPARATE, FLUSH MOUNT)
DWG.No.	C1316-G10- B	06-021-1930-G0	OUTLINE DRAWING

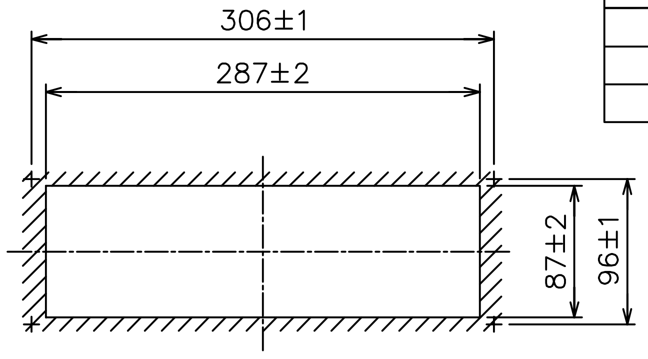
FURUNO ELECTRIC CO., LTD.

FURUNO

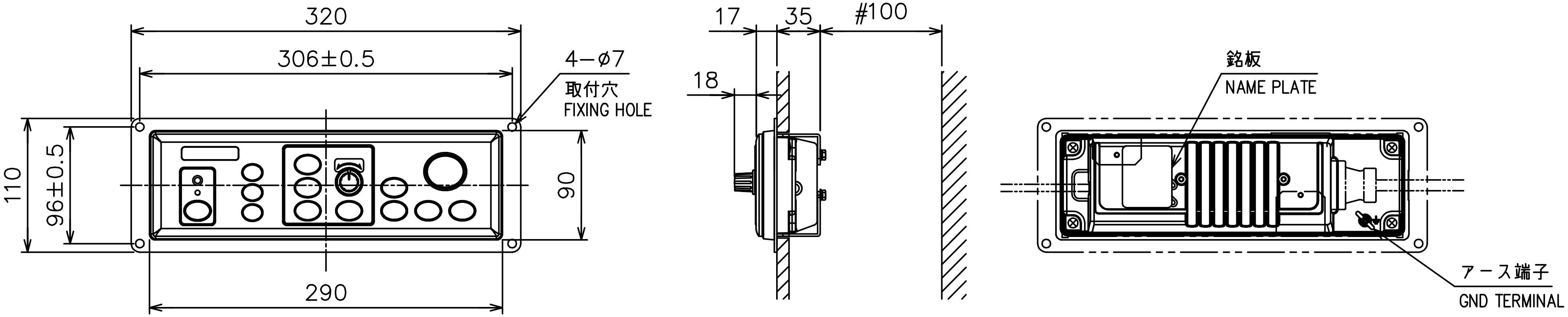
表 1
TABLE 1

寸法区分（ｍｍ） DIMENSIONS	公差（ｍｍ） TOLERANCE
Ｌ≦５０	±１．５
５０＜Ｌ≦１００	±２．５
１００＜Ｌ≦５００	±３





取付穴寸法図
CUTOUT DIMENSIONS



注 記

1） ＃印寸法は最小サービス空間寸法とする。
2） 指定外の寸法公差は表１による。
3） 取付用ネジは＋トラスタッピングネジ呼び径５ｘ２０を使用のこと
4） 装備ケーブルはサービス時、本体を前方に十分引き出せるよう余裕を持たせること。

NOTE
1. #: MINIMUM SERVICE CLEARANCE.
2. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS WHICH IS NOT SPECIFIED.
3. USE TAPPING SCREWS 5x20 FOR FIXING UNIT.
4. KEEP ENOUGH CABLE LENGTH BEHIND UNIT.

DRAWN Oct. 22 '03 E. MIYOSHI
CHECKED Takahashi T.
APPROVED Y. Hatai
CI-68/88
SCALE 1/5 MASS 1.9 ±10% kg
DWG No. C7252-G05- A 66-030-330G- 0

TITLE CI-6888
名称 操作部（埋込装備）
外寸図
NAME CONTROL UNIT (FLUSH MOUNT)
OUTLINE DRAWING

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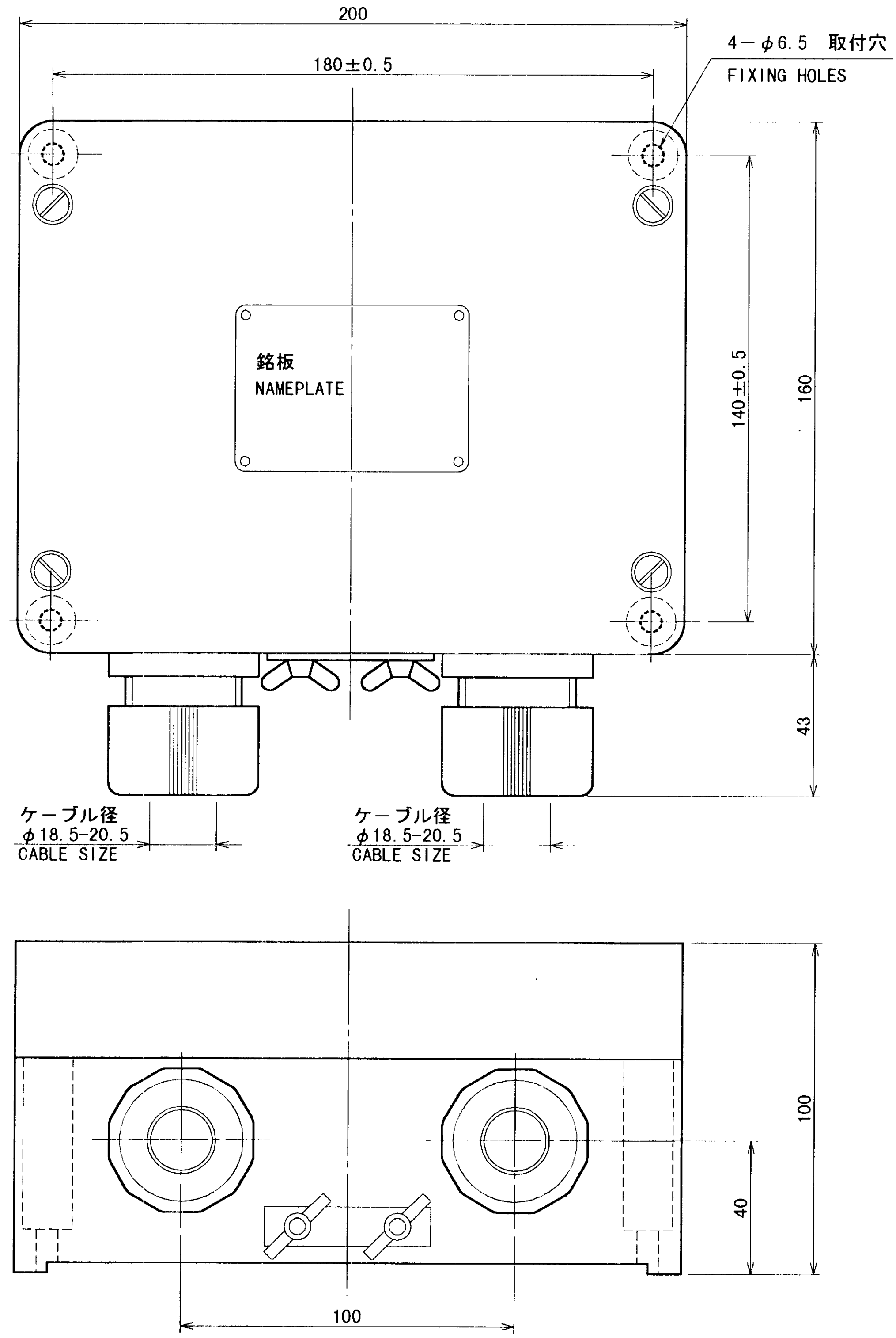


表1 TABLE 1

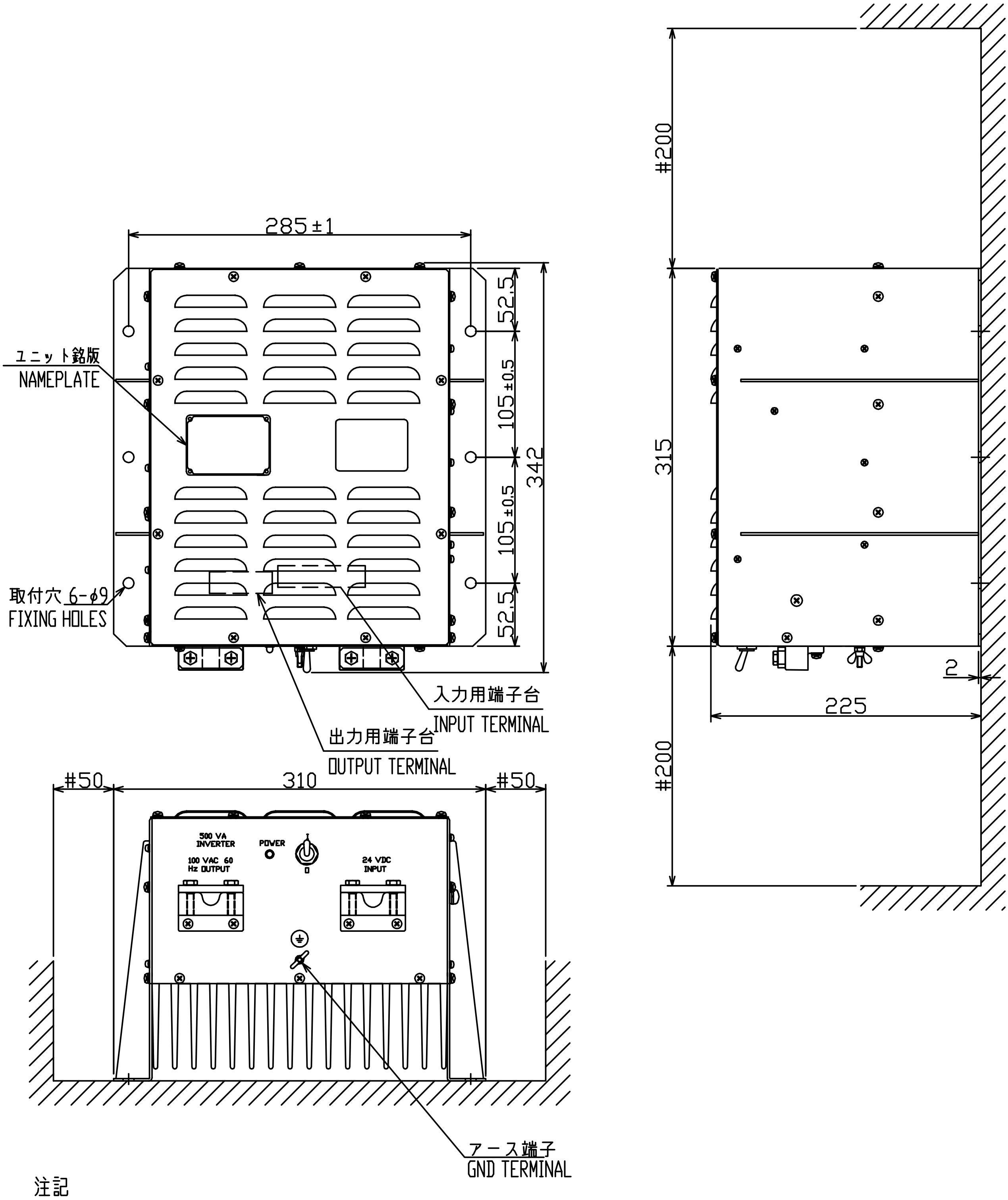
寸法区分(mm) DIMENSION	公差(mm) TOLERANCE
0 ＜ L ≦ 50	±1.5
50 ＜ L ≦ 100	±2.5
100 ＜ L ≦ 500	±3

注記　指定なき寸法公差は表１による。

NOTE　TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.

DRAWN Apr. 17 '00 T. YAMASAKI		TITLE	CI-630
CHECKED Apr 17 '00 Y. K.	DS-50	名称	接続箱
APPROVED Apr 17 '00 Y. K.	CI-80 CI-60/60G		外寸図
SCALE 1/2	MASS 2 kg ±10%	NAME	JUNCTION BOX
DWG. No. C7228-G03- D			OUTLINE DRAWING

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注記
1）指定なき寸法公差は表1による。
2）#：推奨するサービス空間寸法。
3）取付けにはM8ボルトまたはコーチボルト呼び径8を使用のこと。

NOTE
1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.
2. #: RECOMMENDED SERVICE CLEARANCE.
3. USE M8 BOLTS OR COARCH SCREWS φ8 FOR FIXING THE UNIT.

寸法区分(mm) DIMENSION	公差(mm) TOLERANCE
0 < L ≦ 50	±1.5
50 < L ≦ 100	±2.5
100 < L ≦ 500	±3

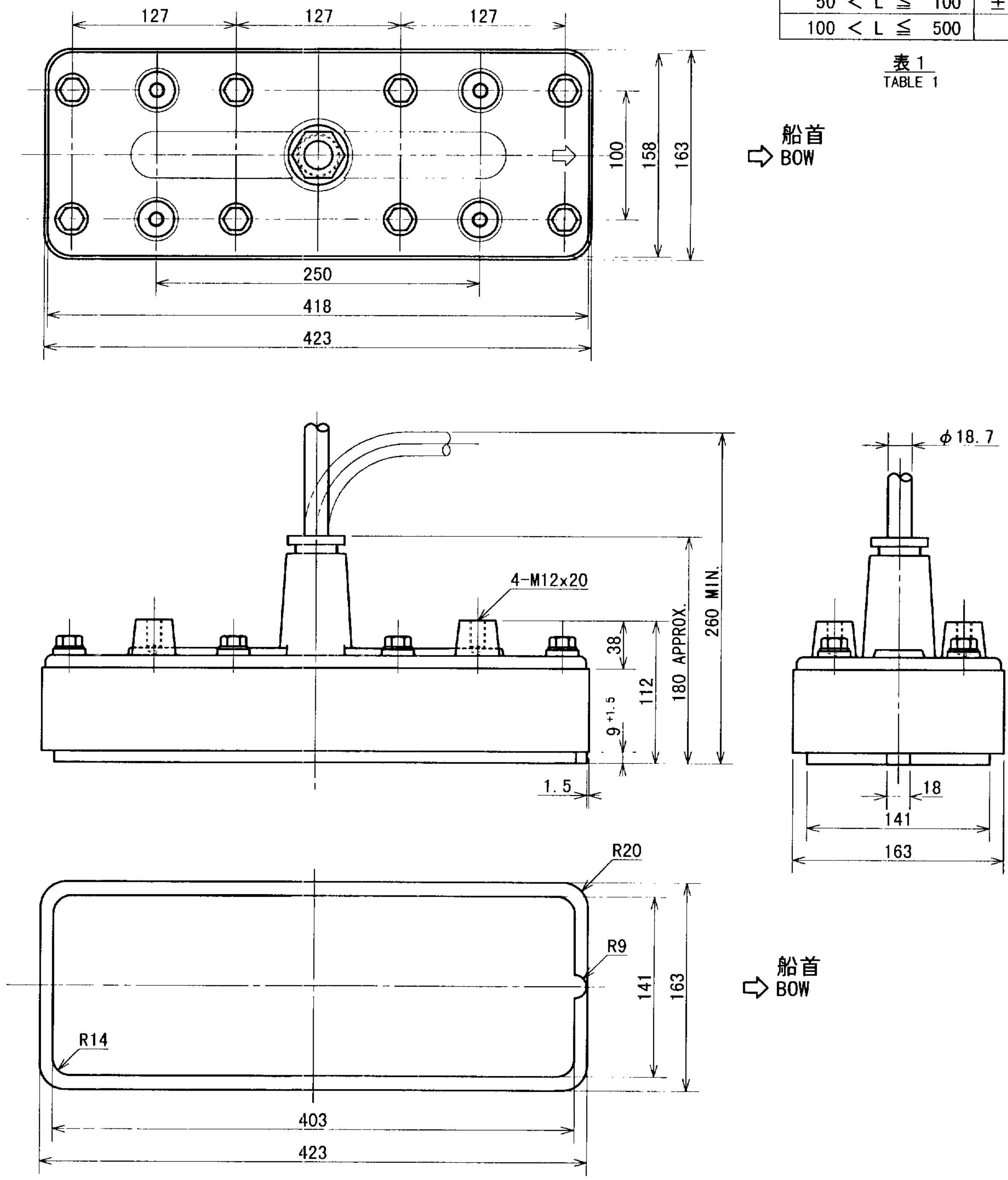
表1 TABLE 1

DRAWN Dec. 13 '02 T.YAMASAKI		TITLE	TR-2451
CHECKED Dec. 16 '02 Y.KIMURA		名 称	DC/ACインバータ
APPROVED	CSH-5L/8L		外寸図
SCALE 1/5	MASS 15 ±10% kg	NAME	DC/AC INVERTER
DWG.No. C1319-G04- B			OUTLINE DRAWING

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寸法区分 (mm) DIMENSION	公差 (mm) TOLERANCE
0 ＜ L ≦ 50	±1.5
50 ＜ L ≦ 100	±2.5
100 ＜ L ≦ 500	±3

表 1
TABLE 1



注記　1）指定なき寸法公差は表１による。
NOTE　1. TABLE 1 INDICATES TOLERANCE OF DIMENSIONS.

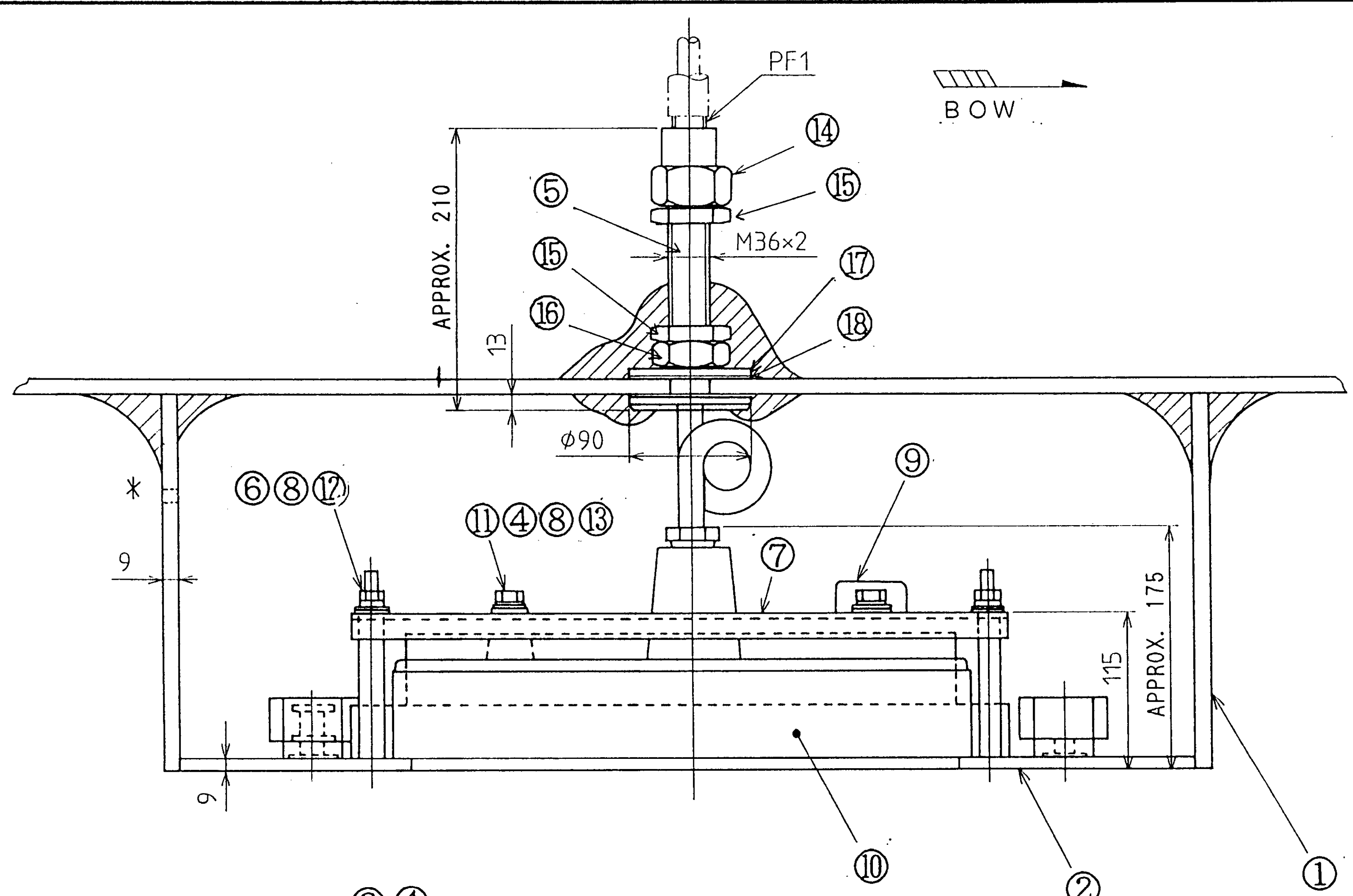
CI-620-1 : 21 kg(10mｹｰﾌﾞﾙ付　W/ 10m CABLE)
CI-620-2 : 26 kg(20mｹｰﾌﾞﾙ付　W/ 20m CABLE)

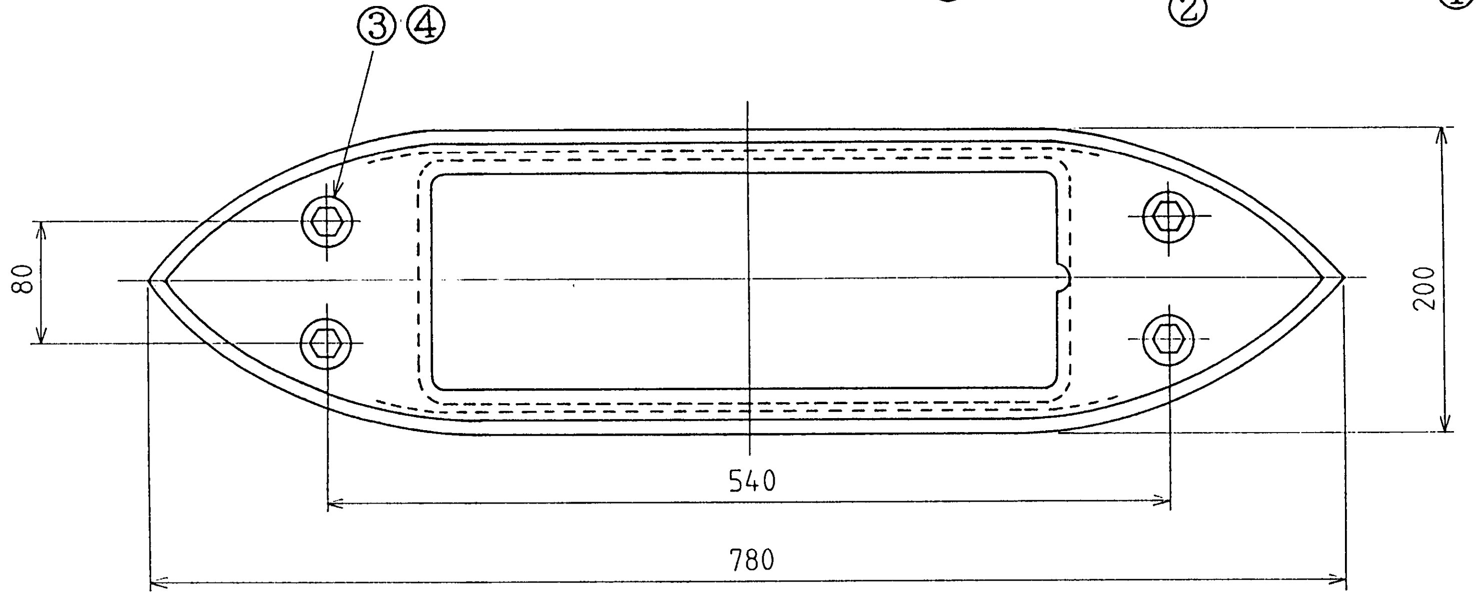
DRAWN Oct.1 '99 T.YAMASAKI	TITLE CI-620
CHECKED Oct.1 '99 K.Kusunoki	名称 送受波器
APPROVED Oct.1 '99 K.Kusunoki	外寸図
SCALE 1/5　MASS kg	NAME TRANSDUCER
DWG. No. C7228-G04- E	OUTLINE DRAWING

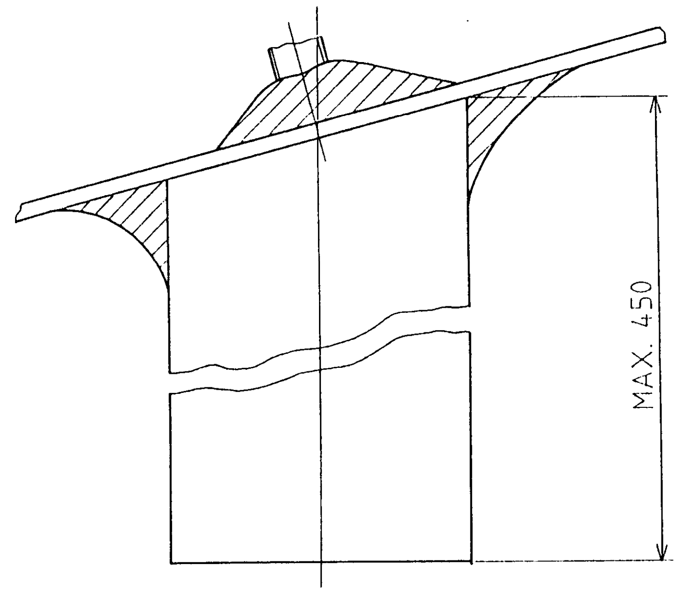
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D - 11







PRINCIPAL ITEM		
POSITION	FROM BOW	m
	FROM KEEL	mm
PROJECTION		mm
FIXING CONDITION	HORIZONTAL AT RUNNING	
PROTECTION TANK		

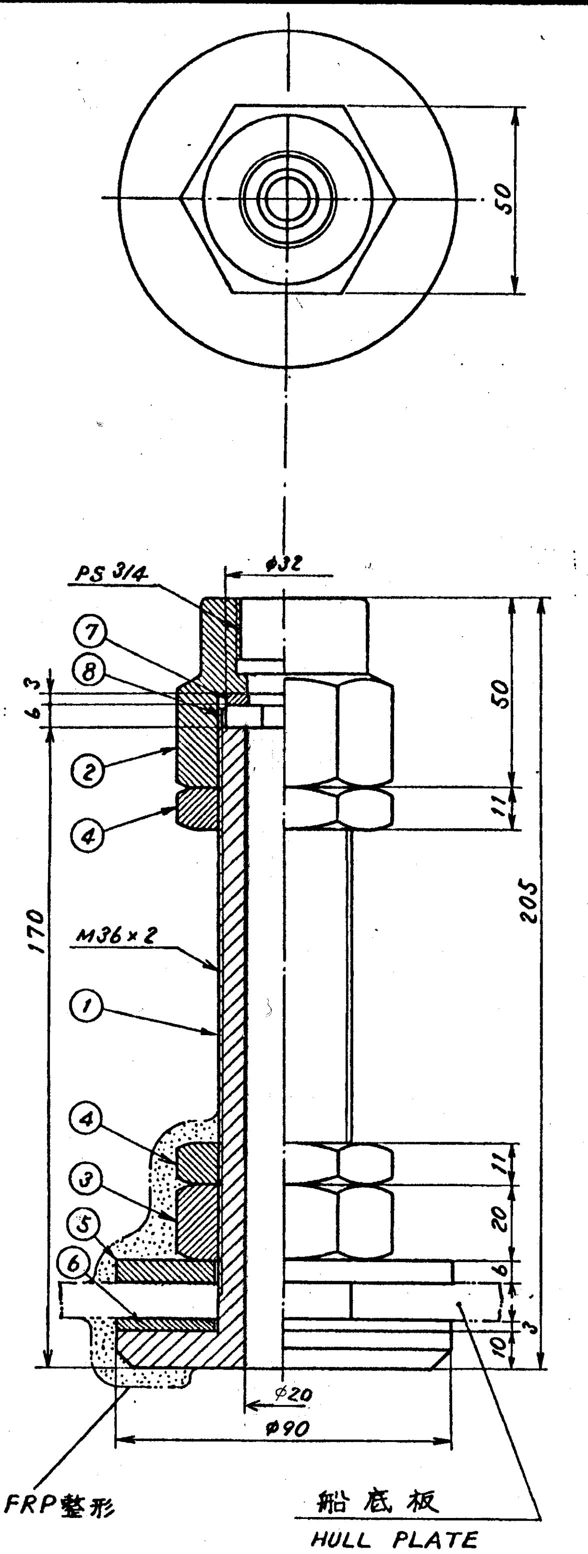
品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG. NO.	摘要 REMARKS
18	GASKET	RUBBER	1	TPB-1003	
17	WASHER	SS41	1	TPB-1002-1	
16	FIXING NUT	SS400	1	TPB-1-03	
15	LOCK NUT	SS400	2	TPB-1-04	
14	CAP NUT	SS400	1	66-017-1506-1	
13	FLAT WASHER	PC	4		
12	FLAT WASHER	RESIN	4		
11	HEX. BOLT	SUS304	4		M12x25
10	TRANSDUCER		1		STD: WITH 10m CABLE
9	ZINC BLOCK		1		
8	FLAT WASHER	SUS304	8		
7	FIXING PLATE	SS400	1		
6	HEX. NUT	SUS304	8		M12
5	THRU-HULL PIPE	BC2	1	66-017-1501-0	
4	SPRING WASHER	BC2	8		M12
3	HEX. BOLT	SUS304	4		M12x40
2	FIXING FLANGE	SS400	1		
1	CASING	FRP	1		

NOTE

1. DECIDE PRINCIPAL ITEMS UPON DISCUSSING WITH SHIP'S OWNER OR SHIPYARD.
2. CUT CASING FOR θ (RING ANGLE OF SHIP'S HULL).
3. ALLOW ENOUGH CLEARANCE AROUND THRU-HULL PIPE FOR EASY TIGHTENING AND SERVICING.
4. FRP MOLD THRU-HULL PIPE ON BOTH SIDES OF HULL PLATE.
5. DO NOT PAINT TRANSDUCER FACE.
6. FRP MOLD INSIDE OF CASING.
7. BEFORE FIXING CASING TO HULL PLATE, FIRST CLEAN HULL PLATE SURFACE WITH A SANDER UNTIL FIBER GLASS APPEARS ON FACE. THEN REMOVE DUSTS, OILS AND SO ON FROM SURFACE.
8. * MAKE A HOLE OF 10 TO 20MM DIA. ON STERN SIDE TO ALLOW WATER TO PENETRATE.

承認 APPROVED	APR. 24. '90 T. NAKANO	三角法 THIRD ANGLE PROJECTION		名称 TITLE	CI-620-T-F TRANSDUCER INSTALLATION (FOR FRP)
検図 CHECKED	APR. 23. '90 M. IKEDA	尺度 SCALE	1/5		
製図 DRAWN	APR. 23. '90 TAKAHASHI	重量 WEIGHT	46 kg	図番 DWG. NO.	E7228-T01-B

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キャップナットの締め付け

1. 貫通金物用体①のねじ部にシールテープにて漏水防止の処理を施す。

2. キャップナット②を手で回せるだけ一杯ねじ込む。

3. 更にスパナで二回転程度確実に締め付ける。但し余り強く締め過ぎるとパッキン⑧が圧縮されて芯線を切断することがあるので漏水を防ぐ程度以上には締めないこと。

4. 最後に止めナット④で固定する。

TO TIGHTEN CAP NUT

1. APPLY SEAL TAPE TO THREADS OF PIPE ① FOR COMPLETE WATERTIGHTNESS.

2. SCREW CAP NUT ② ONTO PIPE ① BY HAND.

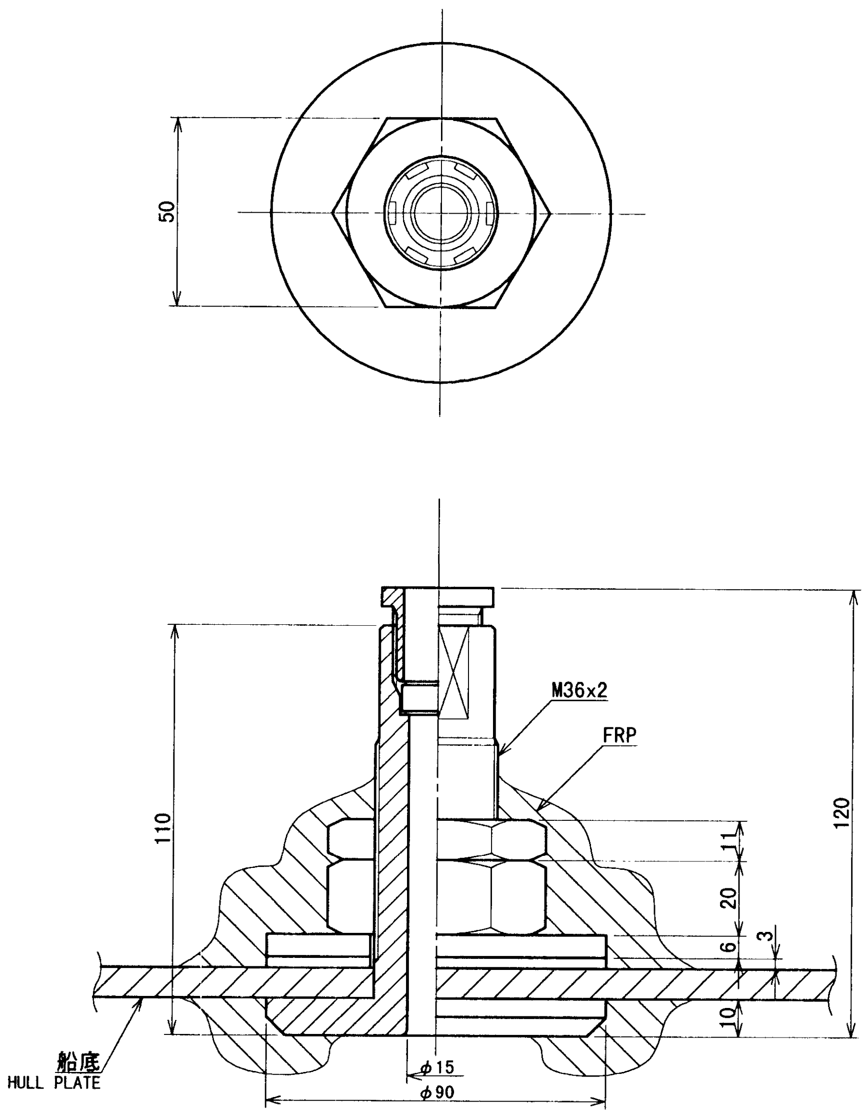
3. THEN CONTINUE ABOUT TWO TURNS WITH A SPANNER. NEVER TIGHTEN CAP NUT ② TOO MUCH. EXCESSIVE TIGHTENING MAY CAUSE THE CABLE TO BE DAMAGED.

4. TIGHTEN LOCK NUT ④

品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG. No.	摘要 REMARK
8	パッキン PACKING	CR	1		
7	座金 WASHER	SS41	1		
6	船底用パッキン PACKING	NR(布入り FIBERED)	1		
5	船底用座金 WASHER	SS41	1	TRB-1002-1	
4	止めナット LOCK NUT	SS41	2	TPB-1-04	
3	船底締付ナット FIXING NUT	SS41	1	TPB-1-03	
2	キャップナット CAP NUT	SS41	1	66-017-1506-1	
1	貫通金物用体 PIPE	BC2	1	66-017-1501-0	

DRAWN Aug 22 '97 T. YAMASAKI			TYPE CI-620-K-F
CHECKED Aug 25 '97 K. Kasuuchi			名称 FRP用電線貫通金物
APPROVED Aug 25 '97 Y. Yamaguchi	CI-60/G		外寸図
SCALE 1/2 MASS 25 kg	APPLICABLE TO; (MODEL)	BLOCK NO.	NAME THRU-HULL PIPE FOR FRP
DWG NO. C7228-G07- B			OUTLINE DRAWING

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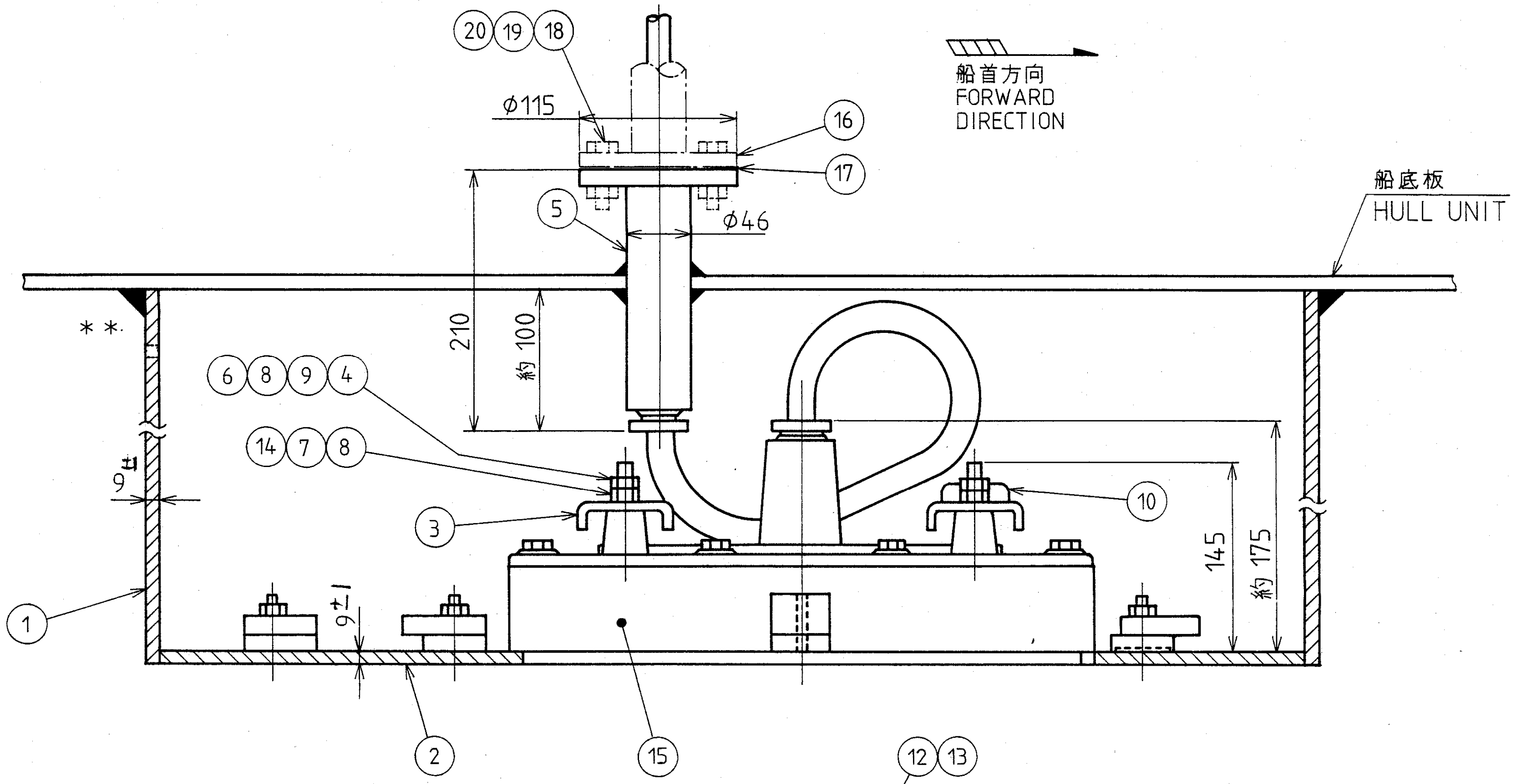


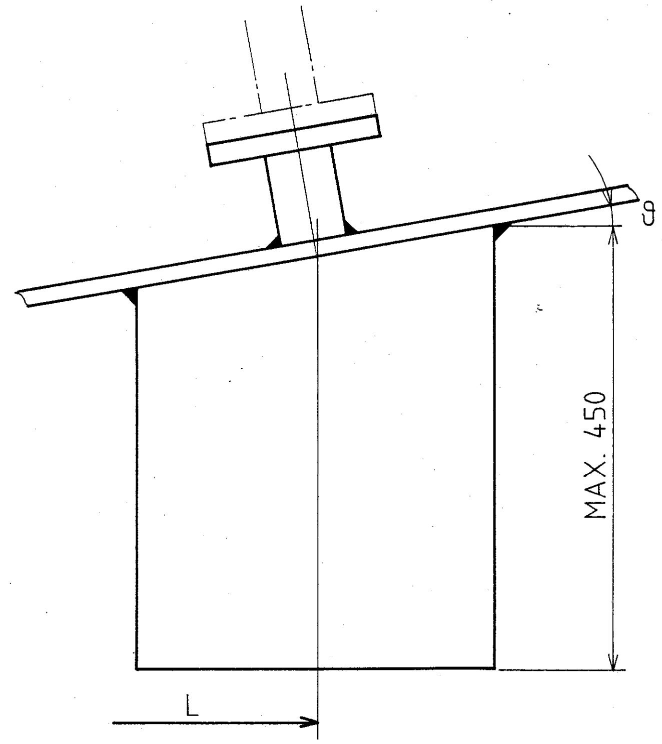
品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG. No.	摘要 REMARKS
8	VAパッキン VA PACKING	CR	1	VA20	
7	平座金 FLAT WASHER	BRASS	2	JIS F8801 20C	
6	締付グランド GLAND	BRASS	1	JIS F8801 20A	
5	船底用パッキン RUBBER PACKING	RUBBER	1	TPB-1003	
4	平座金 FLAT WASHER	SS41	1	TPB-1002	
3	六角ナット HEX NUT	SS41	1	TPB-1-04	
2	船底締付ナット TIGHTENING NUT	SS41	1	TPB-1-03	
1	貫通金物本体 THRU-HULL PIPE	BC2	1	TRB-1501	

DRAWN	June 21 '00 T.YAMASAKI
CHECKED	June 21 '00 Y.Kim
APPROVED	June 21 '00 Y.Kim
SCALE	1/2
MASS	kg
DWG. No.	C2002-G03- B
TITLE	TRB-1500
名称	１５号電線貫通金物 組立図
NAME	THRU-HULL PIPE INSTALLATION DRAWING

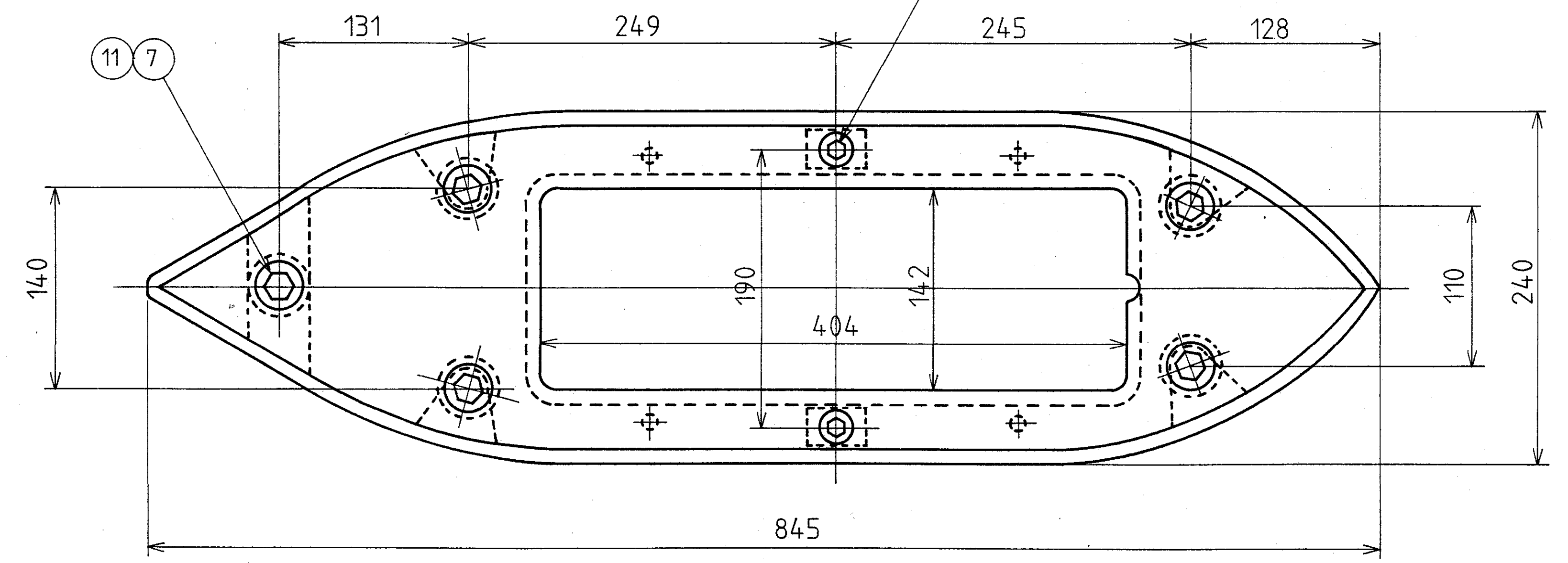
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要目表 PRINCIPAL ITEMS		
位置 POSITION	船首から FROM BOW	m
	キールから FROM KEEL	mm
突出量H PROJECTION		mm
取付状態 FIXING CONDITION		走行時水平 HORIZONTAL AT RUNNING
保護タンク PROTECTION TANK		



注：指定なき公差は1.5%
TOLERANCE IS 1.5% UNLESS OTHERWISE SPECIFIED.

品番 ITEM	品名 NAME	材質 MATERIAL	数量 Q'TY	図番 DWG. NO.	摘要 REMARKS
20	六角ナット HEX. NUT		4	M12	↑
19	バネ座金 SPRING WASHER		4	M12	
18	六角ボルト HEX. BOLT		4	M12×40～50	
17	パッキン GASKET		1		
16	呼び圧力5k差込溶接式フランジ *9	SS41	1	JISB2220 呼び径32	造船所手配 SHIPYARD SUPPLY
15	送受波器 TRANSDUCER		1	標準10mケーブル付 STD; W/10m CABLE	↑
14	六角ボルト HEX. BOLT	SUS304	4	M12×25	
13	六角ボルト HEX. BOLT	SUS304	2	M8×40	
12	バネ座金 SPRING WASHER	SUS304	2	M8	
11	六角ボルト HEX. BOLT	SUS304	5	M12×40	
10	防蝕亜鉛 ZINC BLOCK	ZAP	1	B-1 1/2	
9	平ワッシャ FLAT WASHER	ｼﾞｭﾗｺﾝ RESIN	4	T-201-11	
8	平座金 FLAT WASHER	SUS304	4	M12	
7	バネ座金 SPRING WASHER	SUS304	9	M12	
6	六角ナット HEX. NUT	SUS304	8	M12	
5	電線貫通金物 THRU-HULL PIPE	SS400	1	CI-620-K-S	
4	スペーサ SPACER	SGP	4	66-017-1204	
3	押え板 FIXING PLATE	SGP	2	66-017-1203	
2	送受波器取付フランジ FIXING FLANGE	SGP	1	66-017-1202	
1	送受波器ケース CASING	SS41	1	66-017-1201	古野手配 MAKER SUPPLY

注

1. ※：造船所支給
2. 送受波器ケースはθ（船底傾斜角）に合わせて切断してください。
3. 切断・溶接の際は、歪防止のため送受波器を取り外した状態で“送受波器取付フランジ”を必ず取り付けておいてください。
4. ※※：船尾側上端に通水孔（φ10～φ20程度）を開けてください。
5. 電線貫通金物はフレーム等の邪魔にならない所で送受波器に当らず、キャップナットが容易に締付けられる位置に取付けてください。
6. 網除け、保護タンクは必要に応じて造船所にて製作して下さい。
7. 送受波器面は塗装しないように注意してください。
8. 送受波器ケース取付の際には船首、船尾の確認をしてください。
9. 質量は古野手配分のみで、タンク高さ４５０の場合を示す。

NOTE

1. ※ : SHIPYARD SUPPLY.
2. CUT CASING FOR θ (RISING ANGLE OF SHIP'S HULL.)
3. TO AVOID DISTORTION BY HEAT, PUT "FIXING FLANGE" (WITHOUT TRANSDUCER) ONTO CASING WHILE CUTTING AND/OR WELDING.
4. ※※ : MAKE A HOLE OF 10 TO 20MM IN DIA. ON STERN SIDE TO ALLOW WATER TO PENETRATE.
5. ALLOW ENOUGH CLEARANCE AROUND THRU-HULL PIPE FOR EASY TIGHTENING AND SERVICING.
6. IF NECESSARY, HAVE SHIPYARD PROVIDE NET PROTECTOR AND PROTECTION TANK.
7. DO NOT PAINT TRANSDUCER FACE.
8. CONFIRM FORWARD DIRECTION OF TRANSDUCER.

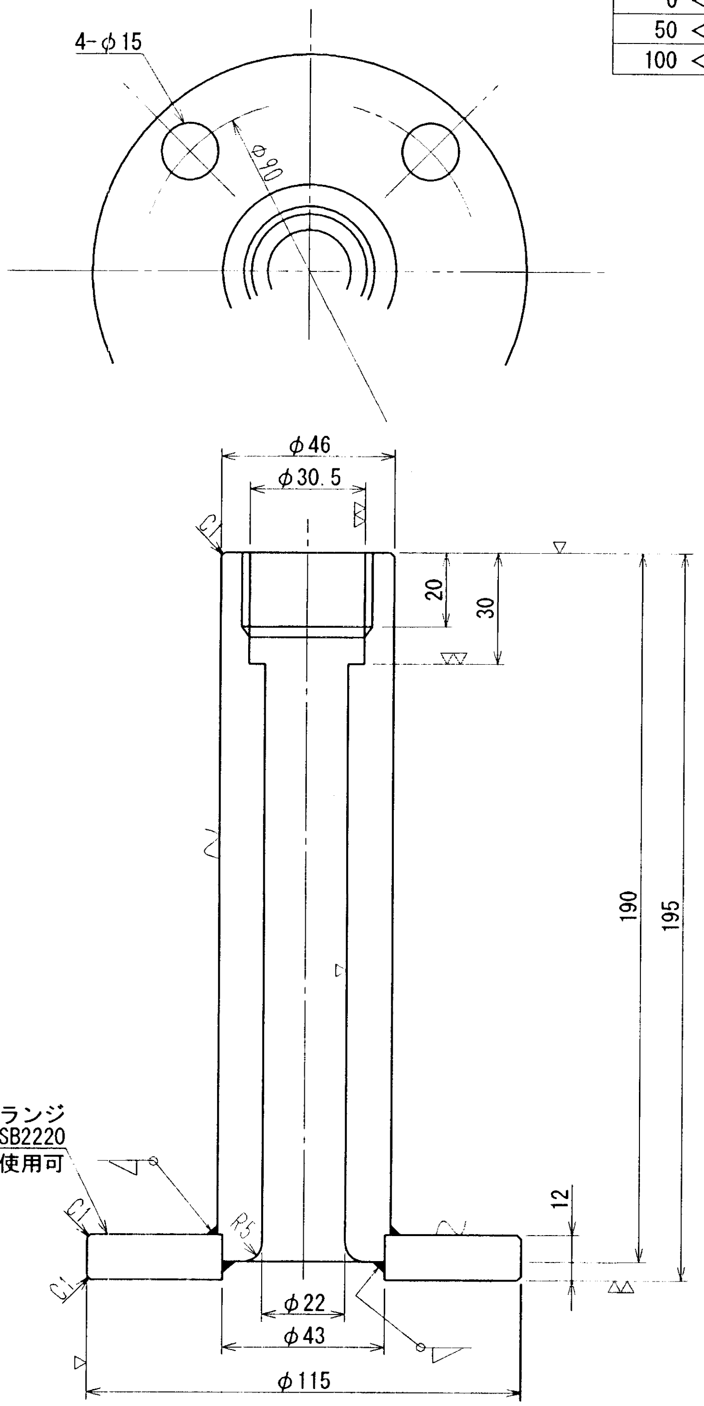
*9. STEEL WELDING PIPE FLANGE: JIS B 2220-5K·10·SS41

承認 APPROVED	APR. 24. '90 T. NAKANO	三角法 THIRD ANGLE PROJECTION		名称 TITLE	CI-620-T-S 送受波器装備図（鋼船） TRANSDUCER INSTALLATION (STEEL HULL)
検図 CHECKED	APR. 23. '90 M. IKEDA	尺度 SCALE	1/5		
製図 DRAWN	APR. 23. '90 TAKAHASHI	質量 MASS	94 kg	図番 DWG. NO.	C7228-T02-F

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表１

寸法区分(mm)	公差(mm)
0 ＜ L ≦ 50	±1.5
50 ＜ L ≦ 100	±2.5
100 ＜ L ≦ 500	±3

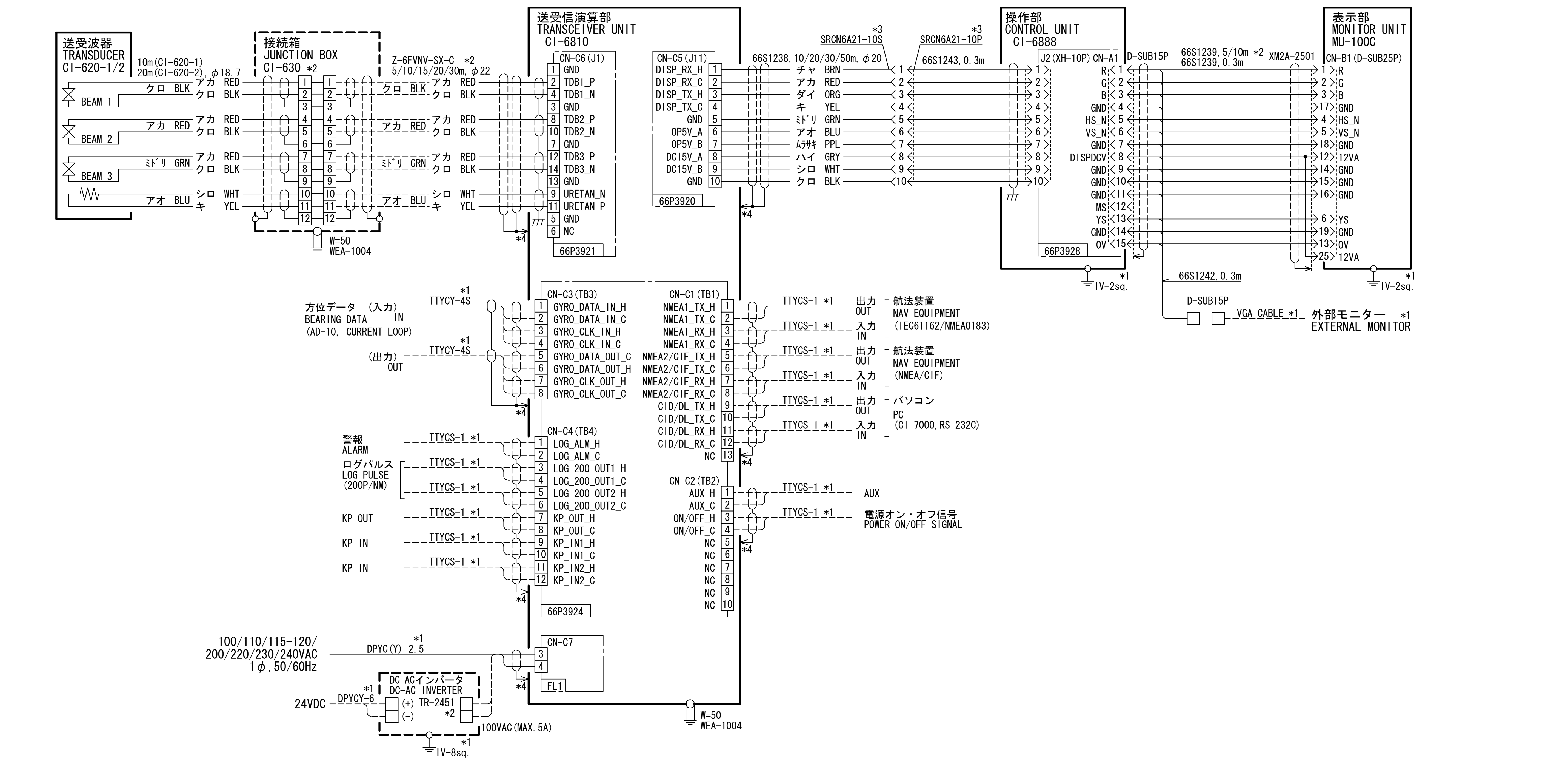


注記

1）指定なき寸法公差は表１による。

DRAWN July 26 '00 T. YAMASAKI		TITLE	CI-620-K-S
CHECKED July 27 '00 Y. Kim		名称	船底貫通金物
APPROVED July 27 '00 Y. Kim			外寸図
SCALE 1/2	MASS ±10% kg	NAME	THRU-HULL PIPE
DWG. No. J7228-G08- B	66-017-1401- 0		OUTLINE DRAWING

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注記
＊１）造船所手配。
＊２）オプション。
＊３）コネクタは工場で取付済み。
＊４）ケーブルクランプでアースする。

NOTE
*1: SHIPYARD SUPPLY.
*2: OPTION.
*3: CONNECTOR PLUG FITTED AT FACTORY.
*4: GROUND THRU CABLE CLAMP.

DRAWN 22/Mar/2011 T.YAMASAKI		TITLE	CI-68
CHECKED 22/Mar/2011 H.MAKI		名称	カラー潮流計
APPROVED 22/Mar/2011 Y.NISHIYAMA			相互結線図
SCALE	MASS kg	NAME	DOPPLER SONAR CURRENT INDICATOR
DWG.No. C7252-C01- C	REF.No. 66-030-0001-1		INTERCONNECTION DIAGRAM